

SYSTEMATIC ACCOUNT OF SOME MARINE INVERTEBRATE ANIMALS FROM THE DEEP BASINS OFF SOUTHERN CALIFORNIA

BY OLGA HARTMAN

INTRODUCTION

All specimens, including holotypes, are deposited in the Allan Hancock Foundation. Ecological data and records of associated organisms are given in a subsequent part of this volume. Reference to bibliographic citations may be found at the end of this account, and in Hartman, 1959.

The collections were largely taken with a grabbing device called the Campbell grab (Hartman, 1955a). This is not effective in rocky habitats; animals characteristic of such bottoms are better recovered with a dredge or trawl, such as were employed during the operations of the USS ALBATROSS (reported by Moore, 1910 to 1923). Consequently some of the deep water species named from basin depths of southern California have not been taken during current operations.

ACKNOWLEDGEMENTS

I am indebted to the Administration of the Allan Hancock Foundation for permission to study these interesting collections, for the use of physical facilities, and for support. The operations of the VELERO IV were partly financed by a grant from the National Science Foundation. Most of the field collecting and sorting of animals to groups was done under the direction of Dr. J. Laurens Barnard. Professor K. O. Emery and his students recovered some of the samples from the basins. Mr. Anker Petersen prepared all the plates of illustrations. I wish to express my gratitude to Captain Allan Hancock, who has continued to support the marine researches of the Allan Hancock Foundation.

SYSTEMATIC LIST OF SPECIES

COELENTERATA

Distichoptilum verrillii Studer

Stephanoscyphus simplex Kirkpatrick

ECHIUROIDEA

Prometor poculum, new species

POLYCHAETA

Family APHRODITIDAE

Lactmonice sp.

Family POLYNOIDAE

Antinoella sp.

Evarnella fragilis (Moore)

Lagisca lamellifera Marenzeller

Lagisca multisetosa Moore

Lagisca pedroensis, new species

Lepidonotus caelorus Moore

Family SIGALIONIDAE

Leanira alba Moore

Leanira calcis, new species

Sthenclanella uniformis Moore

Family AMPHINOMIDAE

Chloeia pinnata Moore

Pseudeurythoë cf. *ambigua* Monro

Family EUPHROSINIDAE

Euphrosine paucibranchiata, new species

Family PHYLLODOCIDAE

Anaitides sp.

?*Eteone* sp.

Eumida tubiformis (Moore)

Eumida spp.

Family LACYDONIIDAE

Paralacydonia paradoxa Fauvel

Family HESIONIDAE

genus and species undetermined

Family PILARGIDAE

- Ancistrotyllis ?tentaculata* Treadwell
Loandalia fauveli Berkeley and Berkeley
Pilargis hamatus, new species

Family SYLLIDAE

- Exogone lourei* Berkeley and Berkeley
Exogone sp.
Langerhansia heterochaeta (Moore)
Syllis sp.

Family NEREIDAE

- Ceratocephala loveni pacifica*, new subspecies
Eunereis caeca, new species
Nereis anoculis, new species
Nereis procera Ehlers
Nereis sp.

Family NEPHTYIDAE

- Aglaophamus* sp.

Family SPHAERODORIDAE

- Sphaerodorum* sp.

Family GLYCERIDAE

- Glycera capitata* Oersted
Glycera capitata branchiopoda Moore
Glycera oxycephala Ehlers
Glycera spp.

Family GONIADIDAE

- Goniada* nr. *brunnea* Treadwell

Family ONUPHIDAE

- Hyalinoecia tubicola stricta* Moore
Nothria hiatidentata Moore
Nothria iridescens (Johnson)
Nothria pallida Moore
Nothria stigmatis Treadwell
Onuphis eremita Audouin and Milne Edwards
Onuphis vexillaria Moore
Onuphis sp.

Family LUMBRINERIDAE

- Lumbrineris californiensis* Hartman
Lumbrineris cruzensis Hartman
Lumbrineris index Moore
Lumbrineris inflata Moore
Lumbrineris ?latreilli Audouin and Milne Edwards
Lumbrineris limicola Hartman
Lumbrineris longensis, new species
Lumbrineris moorei Hartman
Lumbrineris cf. *tetraura* (Schmarda)
Lumbrineris spp.
Ninoë gemmea Moore, var.

Family ARABELLIDAE

- Drilonereis falcata* Moore
Drilonereis nuda Moore
Drilonereis spp.

Family DORVILLEIDAE

- Dorvillea articulata* (Hartman)

Family ORBINIIDAE

- Califa calida* Hartman
Haploscoloplos elongatus (Johnson)
Naineris uncinata Hartman
Phylo nudus (Moore)
Scoloplos acmeiceps profundus, new subspecies

Family PARAONIDAE

- Aricidea (Aedicira) ramosa* Annenkova
Aricidea lopezi Berkeley and Berkeley
Aricidea nr. *succica* Eliason
Aricidea uschakovi Zachs
Aricidea (Cirrophorus) aciculata Hartman
Aricidea (Cirrophorus) furcata Hartman
Aricidea spp.
Paraonis gracilis (Tauber)
Paraonis gracilis oculata Hartman
Paraonis multibranchiata Hartman

Family SPIONIDAE

- Laonice sacculata* (Moore)

Prionospio pinnata Ehlers
Prionospio nr. *cirrifera* Wirén
Prionospio spp.
Polydora sp.
Spiophanes anoculata, new species
Spiophanes fimbriata (Moore)
Spiophanes pallidus, new species
Spiophanes spp.

Family MAGELONIDAE

Magelona pacifica Monro
Magelona sp.

Family CHAETOPTERIDAE

Phyllochaetopterus limicolus, new species
Phyllochaetopterus prolifica Potts
Telepsavus costarum Claparède

Family CIRRATULIDAE

Caulleriella gracilis (Moore)
Chaetozone ?corona Berkeley and Berkeley
Chaetozone spinosa Moore
Cossura candida Hartman
Cossura sp.
Tharyx monilaris, new species
Tharyx tessellata, new species
Tharyx spp.

Family FLABELLIGERIDAE

Brada glabra, new species
Ilyphagus ilyvestis, new species
Pherusa sp.

Family SCALIBREGMIDAE

Scalibregma inflatum Rathke

Family OPHELIIDAE

Ammotrypane pallida, new species
Ophelia sp.
Polyopthalmus translucens, new species

Family STERNASPIDAE

Sternaspis fossor Stimpson

Family CAPITELLIDAE

Leiochrides hemipodus, new species

Mediomastus glabrus, new species

Neoheteromastus lineus, new genus and species

Notomastus magnus Hartman

Notomastus precocis, new species

Notomastus spp.

capitellid, unknown genus and species

Family MALDANIDAE

Asychis lacera Moore

Asychis spp.

Clymenopsis cingulata Ehlers

Euclymene delineata Moore

Lumbriclymene lineus, new species

Lumbriclymene sp.

Maldane cristata Treadwell

Maldane ?*glebifex* Grube

Maldane sarsi Malmgren

Nicomache lumbricalis (Fabricius)

Praxillella gracilis (Sars)

Praxillella trifila, new species

Praxillella sp.

Praxillura maculata Moore

Rhodine bitorquata Moore

Family OWENIIDAE

Myriochele gracilis Hartman

Myriochele pygidialis, new species

Myriowenia californiensis, new genus and species

Family AMPHARETIDAE

Amage longibranchiata, new species

Amage scutata Moore

Amage sp.

Ampharete arctica Malmgren

?*Ampharete* sp.

Amphictcis mucronata Moore

Amphictcis scaphobranchiata Moore

Anobothrus gracilis (Malmgren)

Lysippe annectens Moore

Melinna heterodonta Moore

Melinnampharete coa Annenkova

Melinnexis moorei, new name

Schistocomus hiltoni Chamberlin

Family TERESELLIDAE

Artacama coniferi Moore

Leaena caeca, new species

Neoamphitrite robusta (Johnson)

Pista disjuncta Moore

Pista fasciata (Grube)

Streblosoma crassibranchia Treadwell

Thelepus setosus (Quatrefages)

Family TRICHOBRANCHIDAE

Terebellides stroemi Sars

Family SABELLIDAE

Chone spp.

Myxicola infundibulum (Renier)

Potamethus mucronatus (Moore)

Family SERPULIDAE

Protis pacifica Moore

Vermiliopsis biformis, new species

COELENTERATA
ALCYONARIA

Genus **DISTICHOPTILUM** Verrill, 1882

Distichoptilum verrillii Studer, 1894

(Plate 1, fig. 2)

Nutting, 1909, p. 713, pl. 87, fig. 10.

Specimens of this pennatulid alcyonarian were recovered in 3 samples from San Clemente Basin, all in depths of more than 1000 fms. Identification was made by Dr. Frederick M. Bayer of the United States National Museum, to whom we are indebted. The illustration was made by Mr. Anker Petersen, from a specimen taken at Sta. 6091.

This species was first described off western Mexico in nearly 1000 fms, was reported off the West Indies in more than 1500 fms (Nutting, 1909, p. 713), and also from off San Diego, California, in 1000 fms. The present records are within the range of its known distribution and in comparable depths.

Characteristic features include the slender form of the colony, measuring to 225 mm long. The long axis terminates in a translucent bulb at the base (Plate 1, fig. 2); a slight thickening of the stem is visible about half way along its length. The polyps are in nearly opposite to alternate series, but chiefly dorsal rather than ventral, along the axis. Fresh specimens are light flesh-colored; the rachis is white and the basal bulb is pale yellow. These colors were noted by Dr. J. Laurens Barnard, who prepared the specimens aboard ship.

SCYPHOZOA

Genus **STEPHANOSCYPHUS** Allman, 1874

Stephanoscyphus simplex Kirkpatrick, 1890

(Plate 1, fig. 1)

Kramp, 1959, pp. 174-182, text-figs. 1-9, plate 1, figs. 1-11.

Many small, cornucopianlike, horny, brown, annulated tubes were taken in San Clemente and Velero Basins and San Diego trough, the shallowest in 710 fms in the trough and all others in over 1000 fms. They agree so closely with some described by Kramp (1959) from the collections of the Danish vessel GALATHEA that they are considered identical.

The chitinous tubes measure 15 to 20-28 mm long, are straight or somewhat curved. Most retain the pedal disk and are distally frayed (Plate 1, fig. 1). The tubes range in color from light yellow (when thin) to dark brown. None of the tubes have been found to contain anything but mud and the tests of foraminifers.

Stephanoscyphus simplex has a geographic range extending to all oceans, and a vertical range of more than 3000 fms. It is found in hadal and bathyal depth zones, occurring at temperatures of about 4°C. (Kramp, 1959).

ECHIUROIDEA

Two specimens, representing 2 species in different genera, have been taken in Long and San Nicolas Basins. The larger is an entire specimen and is referred to the genus *Prometor* Fisher (below). The smaller one is fragmented and has not been generically assigned; it may be characterized by having a very broad, laterally frilled proboscis.

Genus **PROMETOR** Fisher, 1947

This is characterized as follows: The proboscis is long, ribbonlike, and has a specialized cup or funnel at its base. A pair of anterior nephridia opens to the exterior by a single median pore. The nephrostome is large, compressed, fan-shaped, and bilabiate, and leads to the exterior through a single pore. Two well developed setae are located at the anterior end; they are set close together. A pair of unbranched anal vesicles is located in front of the posterior anal aperture, each with many glandular tubules. The genus and species are known only through a female; the male may be a dwarf, as is characteristic of the family Bonellidae.

Prometor poculum, new species

(Plate 2, figs. 1-4)

A single large specimen was taken in Long Basin (Sta. 6351). The body is shaped like a cucumber and measures 95 mm long without the proboscis, which is as long again (Plate 2, fig. 1). The proboscis is slender at the base and widens distally into a broad, triangular lobe. The cup-shaped base is pierced centrally by the oral opening. The epithelium of the anterior half of the body is glandular and papillated; its posterior half is abruptly smoother and thinner. The anal pore, on the

posteroventral side of the body, is surrounded by a ring of glandular, columnar ridges (Plate 2, fig. 3); these are presumed to be absent in *Prometor benthophila*.

A pair of large, brassy-yellow spines emerge from the anterior ventral side of the body; a third spine, somewhat smaller, is present on the right side (Plate 2, fig. 2). These spines have a crooked end which broadens out distally into a spatula (Plate 2, fig. 4). A large median pore is immediately behind the setal bases; posterior to this is the pair of anterior nephridia, which can be seen through the body wall and which, when dissected out, are seen as oval sacs containing small spherical ova (Plate 2, fig. 2).

Prometor poculum differs from *P. benthophila* in having a body that is oval, not pear-shaped. The setae are distally spatulate, not tapering. The paired nephridia are short oval, not long. The anal pore is surrounded by columnar gland cells.

Tatjaniella Zenkevitch (1957, p. 292) may be a related genus, as this author has already noted. It was erected for two species originating in the northwest Pacific Ocean, between Kamchatka and Sakhalin, in great depths (4820 meters). They similarly have a cup-shaped organ at the base of the proboscis, but they differ in their details, as described by Professor L. A. Zenkevitch.

POLYCHAETA

Family APHRODITIDAE

Genus LAETMONICE Kinberg, 1855

Laetmonice sp.

A small specimen from Patton escarpment (see App. 1 of this paper for locality data) measures 9.5 mm long and 7.5 mm wide. It differs from *L. pellucida* Moore and *L. producta wyvillei* McIntosh, both recorded from deep water off southern California (Moore, 1910, p. 386), in that the neuropodial setae have a lateral spur much larger than is typical of either species and the fringe beyond the spur is fine and short instead of long and coarse.

Species of this genus are usually abyssal and cosmopolitan in occurrence.

Family POLYNOIDAE

Genus LEPIDONOTUS Leach, 1816

Lepidonotus caelorus Moore, 1903

Moore, 1903, pp. 412-414, pl. 23, fig. 12.

Moore, 1910, p. 333.

This is typically a shallow water species, inhabiting rocky bottoms and seldom in depths greater than those of the shelf and slope. It is reported from San Nicolas Basin (Moore, 1910) to 338 fms and to 1400 fms. The species is nearly related to the cosmopolitan *L. squamata* (Linnaeus); its specific distinction is based on characteristics concerned with details of the elytral spines.

Genus EVARNELLA Chamberlin, 1919

Evarnella fragilis (Moore) 1910*Harmothoe (Evarne) fragilis* Moore, 1910, pp. 353-368, pl. 29, figs. 29, 30; pl. 30, figs. 31-33.

This was originally (Moore, 1910) described off southern California in 150 to 600 fms, from rocky and rubbly bottoms; later from San Nicolas and Santa Cruz Basins (Moore, 1923, p. 256). It approaches the circumboreal *Evarnella impar* (Oersted) and differs from the latter in the details of elytra and setae.

Genus ANTINOELLA Augener, 1928

Distinctions between species of *Antinoella*, with type *A. sarsi* (Kinberg), and those of *Antinoë* Kinberg, with type *A. microps* Kinberg, have not always been recognized. The species mentioned below are believed to belong to *Antinoella* Augener.

Antinoella sp.

Two small specimens, one from Santa Monica and the other from San Pedro Basin, measure less than 6 mm long. They have lost all elytra. The prostomium is subquadrate, widest in front, and has weakly developed peaks at the antero-lateral margins. There are four small black eyespots, an anterior pair at the middle prostomial length, far to the side, and a posterior pair nearer together and at the hinder margin of the prostomium; all are equally small. Notopodial setae are coarsely

serrated, yellow, distally entire, and vary from short, slightly curved, to much longer and nearly straight. Neurosetae are much slenderer, distally entire and hirsute along the shaft.

They differ from *Antinoella macrolepida* (Moore, 1906), with large eyes and no prostomial peaks, and from *Antinoë an oculata* Moore (1910), totally lacking eyes, which are known from great depths off the north Pacific Ocean south to Lower California, Mexico. *Antinoella macrolepida* is further recorded from Sakhalin, Japan (Uschakov, 1958a, pp. 78-79).

Genus **LAGISCA** Malmgren, 1865

Lagisca lamellifera (Marenzeller) 1879

Polynoë (?*Laenilla*) *lamellifera* Marenzeller, 1879, p. 115.

This species was recorded from San Nicolas and Santa Cruz Basins (Moore, 1923, p. 256). Its more extended range includes northern Japan (Marenzeller, 1879).

Lagisca multisetosa Moore, 1902

Moore, 1902, pp. 267-269, pl. 14, figs. 29-36.

This species was recorded from Santa Catalina Basin by Moore (1910, p. 341) in moderate depths to 350 fms. Its more extensive range extends from Alaska to western Mexico, in 1400 fms (Moore, 1910).

Lagisca pedroensis, new species

(Plate 3, figs. 1-5)

Lagisca sp. Hartman and Barnard, this volume, p. 39.

The type specimen comes from San Pedro Basin (Sta. 2500); it measures 21.5 mm long and 4 mm wide and is accompanied by several other smaller ones. The body consists of 40 setigerous segments. The prostomium is one and a half times as wide as long and has distinct peaks; it is deeply incised through its anterior half for the insertion of the median cirrophore. There are 4 black eyes, a pair located at the sides in front of the middle of the lobe, and a similar pair near the postlateral margin of the prostomium.

Elytra number 15 pairs; they are broadly overlapping across the middorsum and leave the last few segments exposed, as typical of the genus. In shape they are reniform, appear smooth but, when magnified, are seen to have a sparse marginal fringe consisting of long to short

alternating filaments. The scar of attachment is seen through the dorsal surface (Plate 3, figs. 1, 2). The upper or exposed surface is lightly covered with hard conical spines of 2 kinds; the larger ones are distally blunt, straight or slightly curved and largely limited to the posterior part of the elytrum. The smaller ones are low and nodular; they have 2 or 3 small peaks, and are dispersed over the antero-medial elytral surface.

Setae are translucent yellow. Notopodial setae, few in a parapodium, are coarser than neuropodial setae and bluntly acicular (Plate 3, fig. 5); they have delicate, widely spaced serrations in transverse series along their free length. They are accompanied by a long aciculum emerging for a considerable distance from the end of a digitate notoacicular lobe. Neuropodial setae are of 2 kinds; 3 superior slender falcigers have a bifid tip (Plate 3, fig. 3) with shorter accessory tooth and a slightly rugose crotch (Plate 3, fig. 4). The shaft is similarly but less coarsely serrated. An inferiormost small fascicle of about 8 slender setae is of another kind; these terminate distally in an entire tip and are geniculate subdistally and coarsely spinous along their free length. These are accompanied by a yellow, rodlike aciculum resembling the notoaciculum; it projects from the neuropodium immediately below a long digitate lobe.

Lagisca pedroensis differs from other species of the genus in having 2 kinds of neuropodial setae, of which the superiormost are distally bifid, and the distal teeth are widely separated. Elytral spines are of 2 kinds.

This species has been recovered only from San Pedro Basin, where it is associated with hexactinellid sponges, other polychaetes, and mollusks of the genera *Limifossor*, *Delectopecten* and *Nitidella*.

Family SIGALIONIDAE

Genus *STHENELANELLA* Moore, 1910

Stehenelanella uniformis Moore, 1910

Moore, 1910, pp. 391-395, pl. 33, figs. 105-112.

This common shallow water species occurs in silty and muddy bottoms where it inhabits mud-covered, mucoid tubes usually greatly exceeding the occupant in size; they are slimy, thickly coated with mud

and difficult to tear. The species has been recovered only as a fragment from Santa Catalina Basin. It has a more extensive distribution and greater concentration on shelf and slope depths of southern California.

Genus **LEANIRA** Kinberg, 1855

Leanira alba Moore, 1910

Moore, 1910, pp. 387-391, pl. 33, figs. 99-104.

A large individual 70 mm long by 5.5 mm wide comes from the San Diego trough. The prostomium lacks eyes and the body is colorless or white. Elytra are plain and smooth; they lack a fringe. Parapodia are characterized by the modifications of long thick fringe extending dorsally over the notopodia.

This species has been known only through its original discovery of one specimen, off Point Loma, in about 650 fms. This second record is near the type locality and from comparable depth; it was taken in silty muds.

Leanira calcis, new species

(Plate 4, figs. 1-5)

A large individual was taken in San Nicolas Basin (Sta. 6340); it measures 70 mm long for 44 segments and 8 mm across the body with parapodia, but it lacks tail and all elytra. The segments are widely separated from one another and parapodial lobes are sufficiently unique to distinguish this species from other nearly related ones.

Parapodial branchiae are emergent from the outer lateral base of the elytral scar; they have a spurlike process on the upper side (Plate 4, fig. 1) to which the specific name refers. Three fimbriated cuplike organs separate the branchia from the upper end of the notopodium. Another fimbriated organ is found on a projecting process located at the lower proximal end of the neuropodium; it resembles an accessory ventral cirrus but is nearer the body and has an auricular projection at its outer base (Plate 4, fig. 1).

The notopodium is located directly over the neuropodium but is much slenderer (Plate 4, fig. 1); it is prolonged beyond the acicular tip as a slender, digitate lobe. Three slender filaments emerge at its subdistal edge. Notopodial setae are simple and slender; they form full tufted fascicles; seen individually, they are nearly smooth along their free length or more or less delicately transversely spinose.

Neuropodia are much larger than notopodia and have a transverse

row of about 5 long fringes at the upper, outer edge, and 3 similar long fringes at the lower, ectal edge. The ventral cirrus is inserted at the inferior edge, proximal to middle. Neuropodial setae are entirely composite and spinigerous, as is characteristic of *Leanira*. Supra-acicular setae are slenderer and their appendage longer than those of subacicular ones; the cutting edge is finely denticulate (Plate 4, fig. 5). Subacicular setae grossly resemble the upper ones but are proportionately shorter and thicker. The shaft is smooth along its length except for a short spurlike process at its outer, widest part. The appendage is nearly smooth along its cutting edge or slightly undulating (Plate 4, fig. 2); its broadest surface is ornamented with short, low ridges which in some lights resemble canaliculae (Plate 4, figs. 3, 4).

Leanira calcis differs from other species of the genus in the spurlike process on the parapodial branchiae and in having an accessory process proximal to the ventral cirrus.

It has been taken only in San Nicolas Basin, in 866 fms.

Family AMPHINOMIDAE

Genus **CHLOEIA** Savigny, 1818

Chloeia pinnata Moore, 1911

Moore, 1911, pp. 239-243, pl. 15, figs. 1-6.

Hartman, 1940, pp. 206-207, pl. 31, figs. 10-13.

This fire-worm is typically a shallow water species, perhaps seldom in the basins, and then only as juvenile, small or stunted individuals; one such was taken in Santa Barbara Basin. The species occurs abundantly in depths of 10-50 fms on sandy bottoms and has its known geographic occurrence limited to southern California.

Genus **PSEUDEURYTHOË** Fauvel, 1932

Pseudeurythoë cf. ambigua (Monro) 1933

Eurythoë ambigua Monro, 1933, pp. 6-7, fig. 2.

Several small individuals come from West Cortes, East Cortes, Long and Velero Basins. They are characterized chiefly by having a long, vermiform body and a greatly reduced prostomial caruncle. The longest measures 8 mm long by 2.4 mm wide and consists of more than 25 segments. All specimens are coiled and brittle; the body is broadest in

front and tapers posteriorly. The prostomium is rounded as a semi-circular lobe and divided into an anterior, broader part and a posterior, much narrower though similar, part with 3 cirriform antennae. There are no visible eyes.

Parapodia are biramous and have the two rami wide apart. Notopodia have a long, slender dorsal cirrus located at the inferior end of the setal tuft. Branchiae are present from the fourth segment and continue back through 7 segments. Acicula are yellow, straight, distally blunt and subapically thickened.

These specimens approach *P. ambigua* in having a rounded prostomium and a greatly reduced caruncle. They differ in that branchiae are present from the third, not fourth setigerous segment. *P. ambigua* is previously known from the Pacific side of Panama in very shallow (1 to 2 meters) depths. The present specimens are from East Cortes, West Cortes, Velero and Long Basins, in depths of 899 to 1038 fms.

Family EUPHROSINIDAE

Genus EUPHROSINE Savigny, 1818

Euphrosine paucibranchiata, new species

(Plate 5, figs. 1, 2)

Euphrosine sp. Hartman and Barnard, this volume, p. 52.

A single specimen comes from Santa Cruz Basin (Sta. 3028). The body is coiled like that of a pill-bug; it is ovigerous and estimated to be about 8 mm long and 3.5 mm wide without, and 7 mm wide with, setae. Segments number at least 15. The caruncle is a long, dark lobe; it carries a short, pale, median antenna. Typical parapodia have slender filamentous branchiae, each with single or at most 2 filaments, resembling the long, slender dorsal cirrus; they are located at the upper, inner end of notopodia. A ventral cirrus, similar in appearance, is located at the lower end of neuropodia.

The notopodium has transverse series of bifurcated setae in which a much longer fang is ornamented with up to 15 serrations along its inner edge; the much shorter fang is only about a third to a fourth as long and smooth (Plate 5, fig. 1). These setae intergrade with others in which serrations are almost lacking. Notopodial setae are much coarser than neuropodial ones (Plate 5, fig. 2) but otherwise similar; the shaft is more than twice as thick and the bifurcated tip is more extensively serrated (Plate 5, fig. 1).

Euphrosine paucibranchiata is distinguished from other species of the genus by having bifurcated setae serrated along the inner edge; branchiae are unusually poorly developed. The species has been recovered only in Santa Cruz Basin in 950 fms.

Family PHYLLODOCIDAE

Genus **ANAITIDES** Czerniavsky, 1882

Anaitides sp.

An individual from Santa Catalina Basin was removed from an onuphid tube; it has thick, rust-colored dorsal and ventral cirri. The dorsum has a pair of dark longitudinal lines, within the parapodial bases. It lacks head end and cannot be identified to species.

Genus **EUMIDA** Malmgren, 1865

Eumida tubiformis Moore, 1909

Moore, 1909, pp. 342-344, pl. 16, figs. 22, 23.

This species was originally described from San Nicolas Basin. It is small, brown to pale yellow, and usually has irregularly scattered dark spots over the dorsum. It has been recovered from slope depths off Santa Catalina Island (unpublished) and may be typically a deep water species.

Eumida spp.

A small specimen, only a few mm long, was taken from Santa Cruz Basin; it was lodged in a sandy maldanid tube. The pharynx is fully everted; it is smooth except for a short subdistal part which is prickly, and the terminal end is surrounded by a circlet of 16 papillae. The prostomium has 4 short cirriform antennae and a larger median one in postmedian insertion; there are no eyes. Dorsal cirri are dark brown, long lanceolate in shape and about 3 times as long as wide. The 2 anal cirri are long and slender. These characteristics may be those of an unknown species.

Another specimen comes from Tanner Basin. It lacks prostomial eyes. A median antenna is inserted near the posterior prostomial margin. Dorsal cirri are thick, suboval and darker than the dusky yellow body.

A third specimen was taken from the Patton escarpment; it was deep yellow in color and very fragmented. Its generic status may be questioned.

Genus **ETEONE** Savigny, 1820**?Eteone** sp.

(Plate 5, figs. 3, 4)

A small, white depressed phyllodocid comes from the Patton escarpment (Sta. 5937). It is nearly complete but lacks head and tail ends. It measures about 9 mm long. Parapodia are uniramous, have short, somewhat imbricated, broadly inserted dorsal cirri (Plate 5, fig. 3) distally surpassed by the setigerous lobe, as is characteristic of some species of *Eteone*. Ventral cirri resemble dorsal cirri but are smaller. A single pale rodlike aciculum extends distally to the end of the acutely pointed acicular lobe or slightly beyond it. Four to six spinigerous setae form a spreading fascicle. They have a shaft ending in a smooth articulation (Plate 5, fig. 4) and a long, slightly curved appendage with delicate serrations along the cutting edge.

Parapodial parts with setae resemble those of *Eteone bistriata* Uschakov (1953b, p. 29) from the north Pacific Ocean but differ from the latter in that dorsal cirri are more reduced in the specimen from California. Another, perhaps nearly related, is *Eteone barantollae* Fauvel (1932, p. 73) from Calcutta, India, in salt water lakes.

?*Eteone* sp. was taken only from the outermost station, at Patton escarpment, in 713 fms.

Family **LACYDONIIDAE**Genus **PARALACYDONIA** Fauvel, 1913**Paralacydonia paradoxa** Fauvel, 1913

(Plate 6, figs. 1-3)

Fauvel, 1913, p. 54, fig. 55.

Fauvel, 1914, pp. 118-121, pl. 7, figs. 1-9.

Uschakov, 1958b, pp. 221-223, figs. 1-2.

Single individuals were taken from stations in San Nicolas, West Cortes, San Clemente, Long and Velero Basins, and all from depths greater than 960 fms.

The body is short, pale to white, slender and appears fragile. Total length of 55 segments is about 15 mm, and width at the widest part or ninth segment is 1.4 mm; thereafter the body is gradually narrower to linear. The prostomium is a short, trapezoidal lobe, widest posteriorly, and has 4 short, subequal antennae at its frontal margin; there are no

eyes. The peristomium is a short simple ring weakly set off from the prostomium (Plate 6, fig. 1). The pharynx (seen only by dissection) is muscular, cylindrical, and extends back through the first 13 segments, or through the widest part of the body; there are no horny or papillar structures.

The first parapodia are uniramous and all others are biramous, with notopodia and neuropodia widely separated (Plate 6, fig. 2). Each ramus is supported by a yellow rodlike aciculum that tapers distally. Notopodia are obliquely truncate, longest at their lower edge and have 6 to 14 simple, hairlike setae in a spreading fascicle. Neuropodia are obliquely truncate in the opposite direction; they are larger and longer than their corresponding notopodia and have 8 to 20 composite spinigers in which the articulation is extremely heterogomph (Plate 6, fig. 3). The appendage is delicately serrated at the cutting edge. The heterogomph tip has been shown as a uniquely separate wishbonelike piece (Fauvel, 1923, fig. 74 h, i) but as interpreted here (Plate 6, fig. 3) it is not highly modified, and the appearance is the result of an overlying sheath of the shaft, partly covering the heterogomph tip and surrounding the base of the appendage. The differences as shown in the illustrations (noted above in the references) are believed to result from various interpretations and may not be specific. At the lowermost part of the neuropodial fascicle there are usually one or two simple, hairlike setae, especially in posterior segments; this feature has been selected to distinguish *P. paradoxa* from the nearly related *P. weberi* Horst (Fauvel, 1932, p. 74); when overlooked, there is little to distinguish the two.

The subacicular lobe of notopodia, and the supra-acicular lobe of neuropodia usually appear conical or inflated, projecting beyond the rest of the parapodial length (Plate 6, fig. 2). Dorsal cirri are short, blunt, presetal in position, and ventral cirri are much shorter.

The curious distribution of this species remains unexplained. First described from off Monaco, Mediterranean Sea in 24 fms (Fauvel, 1913, p. 54), it has been recorded as *P. mortenseni* Augener (1924, p. 311) off New Zealand in shallow water. Fauvel (1932, p. 74) redescribed it from India, and Uschakov (1958, p. 221) from the China Sea in very shallow bottoms. If *P. weberi* Horst (1923, p. 221) is a synonym, it is present also in the Banda Sea in 480 fms. The present records originate entirely from the eastern Pacific Ocean, only in the outer deep basins, and in depths of 962 to 1030 fms. It is not known to occur in shallower depths or closer to shore, where extensive collections have been made.

Family HESIONIDAE

A small white hesionid, represented by fragments only, has been taken only in subsill parts of San Pedro and Santa Catalina Basins. It may represent an unknown genus and species.

Family PILARGIDAE

Genus **ANCISTROSYLLIS** McIntosh, 1879

Ancistrosyllis ?tentaculata Treadwell, 1941

Treadwell, 1941, p. 1, figs. 1-3.

Hartman, 1947, p. 498.

Numerous individuals come from Santa Monica, San Pedro, Santa Cruz, Tanner and Velero Basins. They are not as large or as well developed as those from shallower areas, but agree in other respects. Characteristic features include the presence of thick, curved notopodial spines from the fourth or fifth segment, continuing posteriorly throughout the rest of the body. Antennae and dorsal cirri are long and filiform. The posterior margin of the prostomium is usually straight or may be incised medially, as originally shown. Specimens from Santa Cruz Basin have deep yellow bars across anterior segments and similar pigment spots on upper bases of parapodia; these fade in alcohol.

A specimen from Velero Basin differs in that the surface epithelium is papillated.

A. tentaculata was first described from Long Island, New York, and reported from shallow sea bottoms off southern California (Hartman, 1947, p. 498). It is typically a shallow water species.

Genus **PILARGIS** Saint-Joseph, 1899

Pilargis hamatus, new species

(Plate 7, figs. 4-6)

The specimen selected as type comes from Santa Catalina Basin (Sta. 3025); others are from San Pedro and Tanner Basins. The type, in 4 pieces, measures 27 mm long and 2 mm wide. Others, somewhat larger, measure to 30 mm long. The body is prolonged and greatly depressed. Posterior segments are dark reddish-brown and irregularly strewn with dark specks that fade out in alcohol. The frontal margin of the prostomium is deeply incised medially; it terminates in a pair of

subspherical palpi directed forward. Paired antennae are inserted on the posterior third of the length; they are very short equitriangular and somewhat larger than the anterior palpostyles. The first 5 or 6 parapodia are uniramous; all others are biramous. The first visible segment is the first setigerous.

Large, sharply recurved yellow notopodial hooks are first present from the fourth, fifth, sixth or seventh segment; they occur singly in parapodia and are continued posteriorly perhaps to the end of the body; they are recurved upward and medially. The distal part is roughened (Plate 7, fig. 5). A similar but smaller hook is usually present, deeply embedded in notopodial tissue. Neuropodial setae are of 2 kinds, including slender capillary, and thicker, acicular setae, the latter distally bifid with the end of the main fang recurved and the accessory tooth the smaller (Plate 7, fig. 6).

Notopodial lobes are short, rounded, have a dorsal cirrus above the emergence of the notopodial hooks. Neuropodia are larger, distally rounded and supported by an acicular, embedded rod. A short, triangular ventral cirrus emerges from the inferior end of the parapodium. Dorsal and ventral cirri are slightly papillated or nearly smooth (Plate 7, fig. 4).

Pilargis hamatus differs from other species of the genus (see Hartman, 1947, p. 491, for key to species) in which dorsal cirrophores are short in that the large recurved spines are present far forward.

A posteriorly regenerated specimen from Tanner Basin (Sta. 6345) differs from the type in that the surface epithelium is papillated, resembling a species of *Sphaerosyllis* (family Syllidae). However, large notopodial hooks are present from the sixth segment and the body is unusually depressed; it is questionably referred to *P. hamatus*.

This species is more abundant in deep water than in shallower bottoms; its greatest concentrations seem to be in the inner and middle series of basins.

Genus **LOANDALIA** Monro, 1936

Loandalia fauveli Berkeley and Berkeley, 1941

Berkeley and Berkeley, 1941, pp. 30-31, figs. 4-6.

First described from Newport Bay, California, in inter-tidal mud flats, this species has been taken (unpublished records) more abundantly on shelf and slope areas of southern California. The deepest record is Santa Catalina Basin, in 625 fms. The species is not known outside southern California.

Family SYLLIDAE

Representatives of this family are seldom taken in samples from basin depths. Only a few small, perhaps immature, specimens were recovered, as indicated below.

Genus **LANGERHANSIA** Czerniavsky, 1881

Langerhansia heterochaeta (Moore) 1909

Syllis (Ehlersia) heterochaeta Moore, 1909, pp. 322-325, pl. 15, figs. 1-4.

Syllis heterochaeta Moore, 1923, p. 256.

S. (Ehlersia) heterochaeta Berkeley and Berkeley, 1952, p. 76.

Ehlersia heterochaeta Hartman and Barnard, 1958, pp. 21, 55.

This species was recorded from San Nicolas Basin (Moore, 1923). It occurs more frequently in seabottoms above sill depths.

Genus **Exogone** Oersted, 1845

Exogone lourei Berkeley and Berkeley, 1938

Berkeley and Berkeley, 1938, pp. 44-47, figs. 11, 12.

A specimen was taken in Tanner Basin. The species is characterized by having composite spinigers with a long appendage in anterior segments. It is more extensively known in western Canada and western Mexico (Berkeley and Berkeley, 1948, p. 79).

Exogone sp.

A small individual comes from Santa Barbara Basin, in 280 fms. It lacks long spinigerous setae in anterior segments.

Genus **SYLLIS** Savigny, 1818

Syllis sp.

A small specimen less than 10 mm long, with prolonged palpi, was taken in Santa Catalina Basin in 630 fms.

Family NEREIDAE

Five species in 3 genera are represented; they may be identified according to the following key.

Key to species

- | | |
|--|--------------------------------------|
| 1. Prostomium with eyes | 4 |
| 1. Prostomium without eyes | 2 |
| 2. Ventral cirri bifurcated | <i>Ceratocephala loveni pacifica</i> |
| 2. Ventral cirri simple and cirriform | 3 |
| 3. Proboscis with paragnaths on both oral and maxillary rings | <i>Nereis anoculis</i> |
| 3. Proboscis without paragnaths on oral ring; largest paragnaths present on area VII | <i>Eunereis caeca</i> |
| 4. Paragnaths sparse and very inconspicuous | <i>Nereis procera</i> |
| 4. Paragnaths moderately large and more numerous | <i>Nereis</i> sp. |

Genus **NEREIS** Linnaeus, 1758**Nereis anoculis**, new species

(Plate 7, figs. 1-3)

The type specimen comes from Tanner Basin (Sta. 6345); it measures 120 mm long by 6 mm wide and consists of about 140 segments; another one from the same basin (Sta. 6347) is 78 mm long by 4 mm wide and has slightly fewer segments. A third one comes from San Nicolas Basin (Sta. 6341). The body is pale or white except for the distal ends and margins of parapodial lobes or median and posterior segments; these are dull greenish gray, with the pigment most concentrated in the dorsal lobes, especially along the free margins. The body appears ragged in its posterior half because of the long, widely spaced parapodial lobes. Setae are translucent yellow and acicula are black except for the deeply embedded bases, which are hyaline.

The prostomium is pale, depressed, approximately six-sided, with a narrow frontal margin which is as wide as the bases of the antennae combined. The anterior paired sides are longest and the posterior margin is straight. In one specimen the frontal antennae are paired, another has a single antenna, probably atypical; they extend distally about as far as the paired palpi. The 4 pairs of peristomial cirri are simple, cirriform, with the second dorsal pair the longest and about two and a half times as long as the first ventral or shortest pair. The others are intermediate in length.

The proboscis, seen by dissection, has a pair of horny brown jaws with 7 oblique blunt teeth on each cutting edge. On the maxillary ring, area I has 1 to 3 very small cones, II has 4 large ones, III has 4 in a

transverse row, and IV has 5 or 6 large black cones, the largest on the proboscis. On the oral ring, area V is bare, VI has 2 or 3 sharply pointed cones, VII and VIII together have 4 black cones in a transverse row; all are smaller than the cones on area IV.

Parapodia are lateral throughout, with long triangular, dorsal, middle and ventral lobes that change little in comparative proportions except that they increase in length posteriorly and become pigmented. The first 2 parapodial pairs are uniramous as is typical of the genus. They have long, triangular dorsal and ventral cirri and parapodial lobes that extend beyond their respective cirri. The proportions of middle and posterior parapodia are shown in Plate 7, fig. 1. Dorsal and ventral cirri are similar to each other except that the first is the longer and is inserted at the dorsal edge of the notopodial lobe, proximal to a patch of pigment. Its insertion continues in about the same relations throughout the rest of the body. In postmedian segments the base of the parapodium is prolonged, accounting for the ragged appearance of this region of the body.

Notopodia have slender composite spinigers supported by a tapering black aciculum. In anterior segments these spinigers are in full fascicles, but in middle segments they diminish in number, and are accompanied by a homogomph falciger which is about one and a half times as thick as the accompanying spiniger. The falcigers have an appendage that is lens-shaped and finely denticulate along one edge (Plate 7, fig. 3). Neuropodia have similar slender composite spinigers and a black aciculum; heterogomph falcigers are present in the subacicular parts of the fascicle; these have an appendage much longer than wide and are denticulate along one edge (Plate 7, fig. 2). At greatest length the appendage is about 8 times as long as wide. The posterior end tapers gradually and ends in an anal ring provided with a pair of long, lateral cirri, each about as long as the combined length of the last 8 segments.

Nereis anoculis is characterized by lacking prostomial eyes; posterior parapodia are prolonged in their basal parts. On the proboscis the largest paragnaths are on area IV. It has been taken only in Tanner and San Nicolas Basins. Another *Nereis* from great depths is *N. profundus* Kirkegaard (1956, p. 67) from the Banda Trench in 7250-7290 m. It measures 69 by 8 mm and is thus also a large form. Paragnaths on the maxillary ring are numerous, whereas those on the oral ring are limited to a single row of few cones; jaws have 5 teeth below the main fang.

Nereis procera Ehlers, 1868

Ehlers, 1868, pp. 557-559, pl. 23, fig. 2.

Moore, 1911, p. 246.

Hartman and Barnard, this volume, p. 20.

This is a common shallow water species, most abundant in soft bottoms and in depths of less than 100 fms. It has been recorded only once from basin depths; Moore (1911, p. 246) named it from Santa Catalina and Santa Cruz Basins in depths to 1100 fms.

Nereis sp.

A single anterior fragment comes from San Nicolas Basin (Sta. 6336) in 613 fms. The prostomium has 4 large black eyes; the proboscis has well developed paragnaths on both rings. Median and posterior parapodia are either damaged or missing so that the arrangement of parapodial lobes cannot be ascertained. This may be a representative of one of the shelf species.

Genus *EUNEREIS* Malmgren, 1865*Eunereis caeca*, new species

The type comes from Long Basin (Sta. 6349); another possibly the same is from East Cortes Basin (Sta. 5943). The first measures 65 mm long and 5 mm wide, and consists of more than 80 segments; a smaller one is only 11 mm long, with 40 segments. There is no color except for the black acicula. The prostomium is approximately six-sided, with the anterior end shortest and as wide as the combined bases of the frontal antennae; the posterior margin is the longest; there are no eyes. Frontal antennae are short, cirriform and about two-fifths as long as the prostomium. The first two parapodia are uniramous and all others biramous.

The proboscis, seen by dissection, has a pair of translucent, horny, brown jaws, each with 8 short, broadly rounded teeth along the curved cutting edge and terminating in a long, curved smooth fang. The oral ring of the proboscis lacks paragnaths, or there is a single minute paragnath on area VI. The maxillary ring has its most conspicuous paragnaths on area VII where there are 9 black cones; V has none; VI has about 10 tiny black points and VIII has none or 2-3 very small cones.

Parapodia do not differ greatly between middle and posterior regions of the body. Those of anterior segments have dorsal and middle lobes about equally long and triangular in shape; thereafter the dorsal lobe diminishes in size but continues to be triangular, with the dorsal cirrus inserted at its upper base. Setae in anterior segments are largely composite spinigers. Neurosetae of segments 7 to 20 occur in full tufts and the corresponding notopodial fascicles are much slenderer. Homogomph falcigers are first present in about notopodium 35, number two to a fascicle and are accompanied by one or two composite spinigers and a single slender black aciculum. The homogomph falcigers have an appendage that is lens-shaped, longer than wide, and they are denticulated along one edge, not much different from those of *Nereis anoculis* (above); they are about one and a half times as thick as the accompanying spinigers.

Neuropodia have heterogomph spinigers in supra-acicular positions, and both these and heterogomph falcigers in subacicular position; the latter have an appendage 4 times as long as wide and the longest ones are in the uppermost part of the bundle. Dorsal and ventral cirri are simple cirriform throughout, with the first inserted at the base of the dorsal lobe and the second inserted on the lower side of the parapodium near the body wall.

The genus *Eunereis* is known from the eastern Pacific Ocean for two other species, *E. longipes* Hartman (1936, p. 479) and *E. patagonia* (McIntosh, 1885, p. 228). The first occurs in central California in intertidal zones. It has 4 prostomial eyes and the proboscis has paragnaths on areas VII-VIII arranged as 6 cones in a transverse row. The second occurs in southern South America; it is not known to have homogomph falcigers in notopodia.

Eunereis caeca has been recovered only in Long and East Cortes Basins, in 900 and 980 fms.

Genus CERATOCEPHALA Malmgren, 1867

Ceratocephala loveni pacifica, new subspecies

(Plate 8, figs. 1, 2)

The type comes from West Cortes Basin (Sta. 5939); others are from East Cortes, San Clemente and Long Basins, and from the Patton escarpment.

The largest individuals, perhaps nearly mature, are small and meas-

ure only 7 to 8 mm long for 24 segments; they are less than one mm across. The body is widest at the third to fourth segments. Preserved, there is no pigment. The prostomium is deeply incised at its frontal margin and has a pair of antennae directed forward, much as in the stem species, *C. loveni* Malmgren (1867, p. 176-177, pl. 16, fig. 33). They extend forward nearly to the distal end of the palpi but are much slenderer. Prostomial eyes are lacking.

The 4 pairs of peristomial tentacles are in sets of 2, with the first 2 pairs on each side widely separated from the next 2 pairs. The first 2 parapodial segments are uniramous, as is typical of the genus; they have ventral cirri which are bifurcated, present from the first, and thus different from those of the stem species, where they are simple.

Parapodia of typical segments (Plate 8, fig. 1 shows a tenth one) have well developed notopodial and neuropodial lobes, and bifurcated ventral cirri in which the ventral branch is the larger. The dorsal lobe becomes very large and conspicuous; its cirrophore is carried distally and bears the much slenderer dorsal cirrus at its tip. Acicula, largely embedded, are black except for the base, which is colorless; they occur singly in a ramus. Setae are pale yellow and delicate.

The proboscis, seen only by dissection, has pale yellow, thin, translucent jaws, each piece (Plate 8, fig. 2) with 12 evenly spaced, distally acutely pointed teeth. A few soft papillae are present on the oral ring of the proboscis but their exact number and location have not been determined.

C. loveni pacifica may be compared with the stem species, *C. loveni* Malmgren (1867, p. 176) first described from Sweden, and with *C. borealis* Wesenberg-Lund (1950, p. 18) from West Greenland in 300-550 fms. All three lack prostomial eyes and have a prostomium deeply incised at the frontal margin. In *C. loveni* the jaws have 11 teeth, in *C. borealis* there are 5 coarse teeth, and in *C. loveni pacifica* there are 12 teeth. Bifurcated ventral cirri are first present from the third setigerous segment in *C. loveni* and *C. borealis*, whereas they occur from the first in *C. loveni pacifica*.

Another species of the genus, *C. crosslandi americana* Hartman (1952, p. 16), is common off southern California, in shallow ocean depths of 25 fms or less, where it is associated with a community of *Listriolobus pelodes* Fisher (Barnard and Hartman, this volume, p. 6). This species is readily distinguished from the deep-water one by having prostomial eyes and by its much larger size.

C. loveni pacifica has been found only in outer basins where it has been present in most samples taken from West Cortes, East Cortes, and San Clemente Basins, in depths to over 1000 fms.

Family NEPHTYIDAE

Genus **AGLAOPHAMUS** Kinberg, 1866

Aglaophamus sp.

This family is represented only by an anterior fragment of *Aglaophamus* taken in the San Diego trough in 710 fms. It may be a representative of one of the several species occurring in California (Hartman, 1950, pp. 117-118). Species of this family are mainly shallow water forms.

Family SPHAERODORIDAE

Genus **SPHAERODORUM** Oersted, 1843

Sphaerodorum sp.

One small and two much smaller individuals come from Tanner Basin (Sta. 6348); the largest measures 7.2 mm long and one mm wide, and consists of 32 segments. Large epithelial tubercles are limited to parapodia, one notopodial, the other neuropodial. Dorsal and ventral setae are composite spinigerous and resemble those of *Sphaerodorum brevicapitis* Moore (1909, p. 335) described from off Santa Catalina Island in 2045 fms. This was said to be 39 mm long, 1.6 mm wide and consisted of 96 segments, which is considerably larger than the specimens from Tanner Basin. The specificity has not been established.

Family GLYCERIDAE

Genus **GLYCERA** Savigny, 1818

Glycera capitata Oersted, 1843

Hartman, 1950, pp. 76-77, pl. 11, figs. 1-4.

A small, possibly juvenile specimen comes from Santa Catalina Basin. The species is frequent in shallow bottoms, especially of mixed to silty muds. It is replaced in deeper water by the subspecies (immediately below).

Glycera capitata is considered cosmopolitan in distribution.

***Glycera capitata branchiopoda* Moore, 1911**

Glycera branchiopoda Moore, 1911, pp. 302-304, pl. 20, figs. 155, 156; pl. 21, figs. 157-159.

This species was taken in San Pedro, Santa Monica, Santa Catalina, San Nicolas, East Cortes Basins and in the San Diego trough. It differs from the stem species mainly in having longer parapodial lobes, especially those of the dorsally and ventrally located pairs. Its distribution is limited to deeper waters off southern California, whereas its nearly related stem species is found in shallower depths.

***Glycera oxycephala* Ehlers, 1887**

Ehlers, 1887, pp. 121-123, pl. 41, figs. 7-11.

Hartman, 1950, pp. 70-71, pl. 10, figs. 3, 4.

A single specimen was taken in Santa Barbara Basin. This is mainly a shallow water form, usually present in sediments of red or brown sand. It is more widely known on both sides of tropical America and from California northward to Oregon.

***Glycera* spp.**

Small fragmented or juvenile specimens come from San Nicolas, and Tanner Basins and from the Patton escarpment.

Family GONIADIDAE

Genus **GONIADA** Audouin and Milne Edwards, 1833

***Goniada* nr. *brunnea* Treadwell, 1906**

Treadwell, 1906, p. 1174, figs. 67-70.

Hartman, 1950, pp. 17-19, pl. 1, figs. 1-6; pl. 4, fig. 1.

One to several specimens each come from samples taken in San Pedro, Santa Catalina, San Nicolas, Tanner, San Clemente, East Cortes, West Cortes, Tanner and Long Basins, and from Patton escarpment and the San Diego trough. They consistently differ from shallow water representatives in having the transition from uniramous to biramous parapodia at segments 32/33 to 35/36 instead of 44/45. The prostomium has 8 annuli and the proboscoidal chevrons are typical. Individuals usually have reddish-brown bars across the segments and over parapodial bases. In posterior segments the postsetal lobe is equally bifid, and in other respects the resemblance is continued.

Goniada brunnea was first described off the Hawaiian Islands in 202-220 fms, but has been more widely recorded from other parts of the eastern Pacific Ocean, in shallow depths to 600 fms (Hartman, 1950, p. 19). The present records extend the depth range to nearly 900 fms.

Family ONUPHIDAE

Six closely related species are represented; they may be identified according to the following key.

Key to species

1. Peristomium without tentacular cirri; tube quill-like and translucent *Hyalinoecia tubicola stricta*
1. Peristomium with tentacular cirri; tubes not translucent 2
2. Branchiae entirely simple and unbranched 4
2. Branchiae partly or entirely branched 3
3. Ventral cirri cirriform through 5 or 6 segments; branchiae present from first parapodia *Onuphis eremita*
3. Ventral cirri cirriform through 7 or 8 segments; branchiae first present from parapodia 3-5 and with up to 10-11 filaments where best developed *Onuphis vexillaria*
3. Ventral cirri cirriform through 3 segments; branchiae first present from parapodia 5 and with at most 2 filaments at greatest development *Onuphis* sp.
4. Branchiae present from first parapodia *Nothria iridescens*
4. Branchiae first present after first parapodia 5
5. Ventral cirri cirriform through 5 segments; branchiae first present from parapodia 3 or 4 *Nothria pallida*
5. Ventral cirri cirriform through 3 segments; branchiae first present from parapodium 8 *Nothria stigmatis*
5. Ventral cirri cirriform through 2 segments; branchiae present from segment 14 *Nothria hiatidentata*

Genus **HYALINOECIA** Malmgren, 1867

Hyalinoecia tubicola stricta Moore, 1911

Moore, 1911, pp. 280-292, pl. 18, figs. 96, 97.

A large quill-like tube with specimen was taken in Velero Basin. It measures 200 mm long by 5 to 7 mm wide. The animal within is

closely encased and the anterior end of the body is speckled with dark pigment. The subspecies differs from the stem, *H. tubicola* (Müller), in that the bifid subacicular hooks of posterior segments have the main tooth nearly straight instead of at right angles to the shaft; the maxillary jaws numbered III and IV have more numerous teeth than corresponding ones in the stem (Moore, 1911, p. 281).

This was first named from San Clemente Basin in 1038 fms, in green mud, associated with hydroids, a barnacle, *Scalpellum proximum* Pilsbry, a small stalked tunicate, and an anemone, *Sagartia* sp. (Moore, 1911, p. 282). The specimen from the Velero Basin was associated with a white holothurian and 10 other kinds of polychaetes (see Analyses in the following part of this volume).

Genus **ONUPHIS** Audouin and Milne Edwards, 1833

***Onuphis vexillaria* Moore, 1911**

Moore, 1911, pp. 266-269, pl. 17, figs. 69-76.

Hartman, 1944, pp. 80-83, pl. 5, figs. 90-98.

Large individuals, agreeing with the description of the type, were taken in West Cortes, East Cortes, Long and Velero Basins in depths of 899 to 1285 fms. The species is known more widely south to western Mexico (Hartman, 1944, p. 83).

***Onuphis eremita* Audouin and Milne Edwards, 1833**

Fauvel, 1923, pp. 414-415, fig. 163.

Hartman, 1944, p. 75.

Two specimens come from West Cortes Basin in 835 fms. The species is commoner in shallower, less than 100 fm bottoms off San Diego, where it is most abundant in sediments of red and brown sands (unpublished records). It is more widely known from cosmopolitan areas of warmer parts of the Atlantic and Pacific oceans.

***Onuphis* sp.**

Two individuals come from East Cortes Basin in 899 fms; another from San Clemente Basin in 1018 fms. The longest one occupies a long, about 300 mm, dark, flexible tube, which encloses an animal 126 mm long. The body is attenuate and anteriorly depressed. Ventral cirri are cirriform through 3 segments and thereafter padlike. Branchiae are present from the fifth setigerous segment; they are thick, club-shaped

single lobes, resembling dorsal cirri. Bifurcated branchiae are present from the eleventh segment and this is the maximum number of filaments. The posterior three-fifths of the body lacks branchiae. These specimens resemble *Nothria* in this respect, but do not agree fully with species so named below.

Genus **NOTHRIA** Malmgren, 1867

Nothria hiatidentata Moore, 1911

Moore, 1911, pp. 259-262, figs. 41-50.

The type locality is San Clemente Basin in 1059 fms. In general appearance it resembles a species of *Hyalinoecia* (see above) but it has, instead of lacks, peristomial cirri. It is known only through its original account.

Nothria pallida Moore, 1911

Moore, 1911, pp. 256-259, figs. 24-28, 35-37.

This species is commonly encountered in green muds in offshore areas of southern California in depths less than subsill parts of basins (unpublished records). It has been taken also in Santa Catalina, Tanner, East Cortes and Long Basins. Individuals construct thick-walled tubes of mud, resembling those of a terebellid, *Pista disjuncta* Moore, with which it is often associated. The species may be expected to occur in most or all of the middle and outer series of basins. It is not known outside of southern California, in shallow to basin depths.

Nothria iridescens (Johnson) 1901

Nothia iridescens Johnson, 1901, p. 408, pl. 8, figs. 86, 87.
Hartman, 1944, pp. 87-88, pl. 5, figs. 99-104.

This species was taken in Santa Catalina, West Cortes and Tanner Basins. It is more frequent in shallower depths and has been more widely reported from other parts of the northeast Pacific (Hartman, 1944, p. 88). This species is not clearly separable from *Nothria elegans* (Johnson) (see Hartman, 1944, pp. 88-89) except for features concerning minute details of anterior setae. *N. iridescens* is interpreted as occurring in deeper bottoms with silty sediments, whereas *N. elegans* may dominate shallower, silty sand bottoms.

Nothria stigmatis (Treadwell) 1922*Onuphis stigmatis* Treadwell, 1922, pp. 176-178, figs. 22-34.

Hartman, 1944, pp. 89-91, pl. 11, figs. 240-247.

Specimens were collected from San Pedro Basin and Patton escarpment. The species is more widely known from Washington in littoral zones, south to western Mexico (Hartman, 1944, p. 91). The present records (713 fms) include the deepest known occurrences.

The species is characterized by having ventral cirri cirriform through 3 segments and thereafter padlike. Branchiae are first present at about segment 15. Composite falcigers of anterior segments are distinctly tridentate.

Family LUMBRINERIDAE

Ten species, 9 in a single genus, are recorded from basin depths. These may be identified according to the following key.

Key to species

1. Some parapodia with palmately branched branchiae *Ninoë gemmea*
1. Without branched branchiae 2
2. Anterior parapodia with composite hooks 3
2. Anterior parapodia lacking composite hooks 7
3. Posterior parapodia with 2 long lobes 4
3. Posterior parapodia with a single prolonged lobe 5
3. Posterior parapodia without prolonged lobes
. *Lumbrineris latreilli*
4. Parapodial acicula yellow *Lumbrineris cruzensis*
4. Parapodial acicula black *Lumbrineris californiensis*
5. Parapodial acicula yellow 6
5. Parapodial acicula black *Lumbrineris index*
6. Maxillae 3 and 4 each with several teeth
. *Lumbrineris inflata*
6. Maxillae 3 and 4 each with single tooth
. *Lumbrineris limicola*
7. With long, hairlike setae in some segments 8
7. Without long, hairlike setae *Lumbrineris tetraura*
8. Hooded hooks present from first parapodia
. *Lumbrineris longensis*
8. Hooded hooks absent from first 20 segments
. *Lumbrineris moorci*

Genus **LUMBRINERIS** Blainville, 1828**Lumbrineris californiensis** Hartman, 1944

Hartman, 1944, pp. 163-165, pl. 12, figs. 257-262.

A small individual comes from Santa Catalina Basin, and another, questionably the same, from West Cortes Basin. This is typically a shallow water species, known only from southern California north to Carmel Bay, California.

Lumbrineris cruzensis Hartman, 1944

Hartman, 1944, pp. 165-166, pl. 12, figs. 263-269.

A small individual was taken in Santa Monica Basin; a questionable record is from Long Basin. The species is commonly encountered in shallow benthos of southern California, in sediments of fine silts with much detritus. Its known geographic range is limited to southern California.

Lumbrineris index Moore, 1911

Lumbrineris japonica index Moore, 1911, pp. 288-289, pl. 19, figs. 119-127.

Hartman, 1944, pp. 162-163, pl. 12, figs. 254-256.

Specimens were taken in San Pedro, Santa Catalina, Tanner and questionably West Cortes Basins. Previous records reported the species from southern and central California in 16 to 704 fms.

Lumbrineris inflata Moore, 1911

Moore, 1911, pp. 289-291, figs. 128-134.

Hartman, 1944, pp. 160-161.

This species was taken in Santa Catalina Basin and the San Diego trough in depths to 710 fms. It is more extensively known from the northeast Pacific Ocean, south to the Gulf of California, Mexico, in littoral depths.

Lumbrineris ?latreilli Audouin and Milne Edwards, 1834

Lumbriconereis Latreilli Fauvel, 1923, pp. 431-432, fig. 171.

Hartman, 1944, pp. 158-159, pl. 9, figs. 213-216.

Three small, perhaps immature, individuals from San Clemente Basin are questionably referred to this species. Some acicula are partly black

instead of yellow and thus approach the condition known for *L. japonica* Marenzeller (see Hartman, 1944, p. 159).

L. latreilli has a world-wide distribution.

***Lumbrineris limicola* Hartman, 1944**

Hartman, 1944, pp. 161-162, pl. 11, figs. 230-237.

Numerous individuals come from East Cortes, West Cortes, San Nicolas and Tanner Basins. All are much smaller than typical specimens from shallower ocean bottoms off southern California, and the prostomium is rounded in front instead of being equitriangular.

***Lumbrineris* cf. *tetraura* (Schmarda) 1861**

Hartman, 1944, pp. 147-149, pl. 8, figs. 175, 190, 191; pl. 9, figs. 192-195.

A specimen from Santa Catalina Basin in 597 fms agrees with this species as interpreted by Hartman (1944, p. 144). The species is more extensively known from southern California south to Chile, usually in shallow littoral depths.

***Lumbrineris moorei* Hartman, 1942**

Hartman, 1942, pp. 116-118, fig. 12.

The present finds are from San Nicolas, Velero and questionably San Clemente Basins. The species is characterized by having only simple limbate setae in the first 25 or more segments. Simple hooded hooks are present in more posterior parapodia. The species was first described from off Santa Catalina Island in 1350 to 2180 fms. It is known only through these records.

***Lumbrineris longensis*, new species**

Two individuals come from Long Basin (Sta. 6350) in 916 fms. Total length of the larger one is 120 mm and width, without parapodia, is 5 mm. Segments number more than 260 (a tail end is lacking). The body cavity contains large ova. The anterior end is unusually narrowed and the prostomium is a small depressed conical lobe, dusky except for a pale tip; it lacks eyes. The first 2 segments are smooth rings, with the second one about as long as the first setigerous segment and the first ring somewhat longer.

The anterior third region of the body has unusually long, slender capillary setae; they are present from about segment 14 through 30 and

occupy a supra-acicular position, where they number 4 to 7 in a fascicle. They are accompanied by simple hooded hooks in an inferior position in the fascicle.

The jaws, seen by dissection, consist of mandibles and maxillae. Maxilla I is falcate; II has 5 teeth on a side, with the teeth subequal; III and IV each have a single tooth. The mandibles are fused along their medial length and have a deep distal notch at the anterior or widest part.

Parapodia are lateral throughout; those of anterior segments have broad, short lobes, with the pre- and postsetal lobes about equally long, but the posterior one the slenderer. In the posterior region the pre- and postsetal lobes elongate and are distally divergent; they resemble those of *Lumbrineris californiensis* (Hartman, 1944, pl. 12, fig. 260). Long, slender, simple hooded hooks are present from the first parapodium, accompanied by limbate, distally pointed setae. The number of hooks increases so that within a few segments they are equal in number to the pointed setae. The hooks occupy the middle of the series and the longer, pointed setae are at either end. At segment 12 to 14 the pointed setae are abruptly longer and hairlike, and after segment 30 they are nearly absent.

Acicula are pale translucent in their distal parts, and fuscus to nearly black in their deeply embedded portion; they number 3 or 4 in a parapodium and terminate distally in a greatly attenuated tip, protruding from the tapering parapodial lobes like thick needles. At first sight, they look like a kind of modified seta, but their bases can be seen to extend far into the parapodial base, a characteristic of acicula.

Lumbrineris longensis is chiefly characterized by having long hairlike setae in some median segments; composite hooks are absent; posterior parapodial lobes are bilabiate, having both pre- and postsetal lobes elongated. Acicula terminate distally in needlelike points and project from parapodia.

L. longensis differs from *L. moorei* (see above), which also has long, hairlike setae in some median segments, in that these setae are in the middle, not the inferior position in the setal fascicle. It differs from *L. bifilaris* (Ehlers) (see Hartman, 1944, p. 153) which has the first 55 segments provided with long pointed setae in a superior position.

L. longensis has been taken only in Long Basin; it is presumed to be an abyssal form which may have its more extended distribution in deeper ocean bottoms off California.

Lumbrineris spp.

Small fragmented or juvenile individuals come from San Nicolas and Tanner Basins and from the Patton escarpment. They may be representatives of named species. The genus is represented in southern California by no fewer than 14 species (Hartman, 1944, p. 139); these can be ecologically ranged according to depth and kinds of sediments, from intertidal levels to abyssal depths, and from fine silts to coarse and rocky bottoms. The species are believed to be conditioned not only to these physical factors, but to other species with which they are associated. (Analyses by sample number may be consulted in another part of this volume.)

Genus *NINOË* Kinberg, 1865*Ninoë gemmea* Moore, 1911, var.

Moore, 1911, pp. 283-285, pl. 19, figs. 101-109.

Nearly 50 individuals come from Santa Catalina, Santa Cruz, San Nicolas, Tanner, East Cortes and Long Basins, with the first the best represented. The species is best known from shelf and slope bottoms (unpublished). The basin samples differ from typical ones in that branchiae are present from the second, instead of a later segment, and they have up to 6 filaments, all exceeded in size by the accompanying dorsal cirrus, which is somewhat foliose. Branchiae are continued through 16 or 17 segments and are abruptly absent thereafter. The prostomium is bluntly conical, longer than wide, or more than twice as long as wide; it lacks eyes. The first 2 segments are short, smooth rings. Hooded hooks, accompanied by pointed setae, are present from the first parapodium; they are dusky to black along most of their length except for the tip, which is pale. Acicula are black.

Ninoë gemmea differs from *N. fusca* Moore (1911, p. 285), described from abyssal depths off southern California, chiefly in that the latter has only unifilar branchiae and hooded hooks are not present before segment 48. *N. gemmea* is more typically a shallower water species; it has been frequently collected from shelf and slope depths (unpublished data).

Family ARABELLIDAE

Genus **DRILONEREIS** Claparède, 1870***Drilonereis falcata*** Moore, 1911

Moore, 1911, pp. 298-299, pl. 20, figs. 150-154.

Hartman, 1944, p. 179.

Hartman and Barnard, this volume, p. 37.

A specimen comes from San Pedro Basin. The species occurs more commonly in shallower than basin depths; its known distribution includes California and western Mexico (Hartman, 1944, p. 179).

Drilonereis nuda Moore, 1909

Moore, 1909, pp. 254-256, pl. 8, figs. 21-23.

Hartman, 1944, pp. 178-179, pl. 13, figs. 297-302.

D. sp., Hartman and Barnard, this volume, p. 46.

Specimens were taken in San Pedro and Santa Catalina Basins. The species is characterized by having a very slender prolonged body; posterior parapodial lobes do not elongate. The species is more typically a shallow water form and seldom descends to basin depths.

***Drilonereis* spp.**

Small, juvenile, or vegetative (non-reproductive) stages come from Santa Catalina, Santa Cruz, San Nicolas and Long Basins. They are small, less than 20 mm long, and some have posterior parapodia with prolonged postsetal lobes, similar to those of *Drilonereis longa* Webster, known from the eastern shores of the United States (Hartman, 1945, p. 51). Species of the genus are largely littoral or neritic forms.

Family DORVILLEIDAE

Genus **DORVILLEA** Parfitt, 1866***Dorvillea articulata*** (Hartman) 1938*Stauroneris articulatus* Hartman, 1938, pp. 101-102, figs. 39-44.

Hartman, 1944, p. 189.

Smaller than typical representatives come from San Pedro, East Cortes, questionably Long Basins and from Patton escarpment. The largest measure 7.5 mm long for 40 segments; the prostomium usually lacks eyes, unlike the shallow water forms. The distal end of neuropodia is more prolonged and ventral cirri are longer and slenderer than is

typical. The dorsal cirrophore extends distally beyond the distal ends of neuropodial lobes. Simple and composite setae are like those in shallow water representatives. The species is more widely known from California in shelf to slope ocean depths.

Family ORBINIIDAE

Five species in as many genera are represented; they are identifiable according to the following key.

Key to species

1. Anterior margin of prostomium truncate . . . *Naineris uncinata*
1. Anterior margin of prostomium more or less acutely pointed . . . 2
2. Thoracic neuropodia with only slender, pointed setae . . .
 *Haploscoloplos elongatus*
2. Thoracic neuropodia with pointed setae and modified hooks . . . 3
3. First 3 neuropodia with modified brushlike setae
 *Califia calida*
3. First 3 neuropodia without modified setae 4
4. Posterior thoracic neuropodia with thick, brown, hastate spines
 *Phylo nudus*
4. Posterior thoracic neuropodia without thick spines
 *Scoloplos acmeiceps profundus*

Genus **NAINERIS** Blainville, 1828

Naineris uncinata Hartman, 1957

Hartman, 1957, pp. 301-302, pl. 38, figs. 1-8.

Three individuals come from San Pedro Basin in 440 fms. The species is more completely known from southwestern Oregon in shallow bottoms of hard-packed sand with eel grass, and Alaska, shore, to southern California in depths to 340 fms. Its presence in deeper bottoms at the southern limits of its range may be correlated with requirements of lower temperatures, like those of littoral depths at the northern end of its known range.

Genus **HAPLOSCOLOPLOS** Monro, 1933

Haploscoloplos elongatus (Johnson) 1901

Scoloplos elongata Johnson, 1901, pp. 412-413, pl. 10, figs. 105-110.

Berkeley and Berkeley, 1952, pp. 97-98, fig. 200.

Hartman, 1957, pp. 273-275, pl. 26, figs. 1-11.

Small specimens were taken in Santa Cruz and Tanner Basins. The species attains its maximum size and abundance in shallow (about 25 fm) depths in southern California. Its geographic range extends northward to Alaska, in shallow littoral depths.

Genus **PHYLO** Kinberg, 1866

Phylo nudus (Moore) 1911

Aricia nuda Moore, 1911, pp. 311-315, pl. 21, figs. 172-176.
Hartman, 1957, p. 268.

A specimen was taken in West Cortes Basin in 835 fms. The species was first described from the vicinity of San Diego, California, in 497 fms. It has been more widely recorded from Burma in 68 meters (Fauvel, 1932, p. 162). It may be regarded as a deep water form.

Genus **SCOLOPLOS** Blainville, 1828

Scoloplos acmeceps profundus, new subspecies

Scoloplos acmeceps Chamberlin, 1919a, pp. 15-16.

Scoloplos acmeceps Hartman, 1957, pp. 282-283, pl. 30, figs. 1-7.

Scoloplos armiger Hartman and Barnard, this volume, p. 34.

The type of the new subspecies is from East Cortes Basin (Sta. 5943) in 899 fms; others are from different places in East Cortes and Long Basins and Patton escarpment. They differ from the stem species in details believed to have subspecific significance. Thoracic neuropodia are provided with spinigerous setae like those in notopodia. In addition, they have an inferior series of simple yellow falcigers nearly smooth along their free length except for slight serrations at the cutting edge. The prostomium is equitriangular in shape, plain, and lacks eyespots. The everted proboscis is a smooth sack. Branchiae are present from segment 11 as simple, inconspicuous filaments, and so continued throughout the rest of the body. All parapodial lobes are unusually inconspicuous, and thus unlike those in the stem species.

The subspecies differs from the stem in the following respects: branchiae are first present from segments 14 to 20 in the stem, and from segments 11 to 13 in the subspecies. The transition from thorax to abdomen occurs at segments 19 to 26 in the stem, and at segments 14 to 15 in the subspecies. The parapodia are moderately developed in the stem, and very obscure in the subspecies.

Scoloplos acmeceps is known from Alaska south to western Mexico, in littoral zones, associated with algae and other plants. The subspecies *profundus* has been found only in the deeper parts of the basins, in sediments of green silty muds.

Genus CALIFIA Hartman, 1957

Califia calida Hartman, 1957

Hartman, 1957, pp. 306-308, pl. 42, figs. 1-3.

Individuals were taken in West Cortes, East Cortes, San Clemente and Velero Basins. They agree with some coming from the deeper parts of the San Pedro slope, the type locality. The species may be regarded as typically a deep water or basin form.

Family PARAONIDAE

Nine species in 4 genera or subgenera are represented. They may be identified according to the following key.

Key to species

- | | |
|--|----------------------------------|
| 1. Prostomium without a median antenna | 2 |
| 1. Prostomium with a median antenna | 4 |
| 2. Branchiae number 28 to 36 pairs | <i>Paraonis multibranchiata</i> |
| 2. Branchiae typically fewer than 20 pairs | 3 |
| 3. Prostomium without paired eyespots | <i>Paraonis gracilis</i> |
| 3. Prostomium with a pair of eyespots | |
| | <i>Paraonis gracilis oculata</i> |
| 4. Prostomial antenna branched | <i>Aricidea ramosa</i> |
| 4. Prostomial antenna simple, cirriform to very short | 5 |
| 5. Postbranchial segments with spinelike hooks in notopodia | 6 |
| 5. Postbranchial segments with spinelike hooks in neuropodia | 7 |
| 6. Branchiae number about 15 pairs; body pale | |
| | <i>Aricidea aciculata</i> |
| 6. Branchiae number usually more than 30 pairs; body reddish brown or speckled | <i>Aricidea furcata</i> |
| 7. Prostomial antenna greatly prolonged; anterior thoracic region and prostomium broadly depressed; larger in size | |
| | <i>Aricidea uschakovi</i> |
| 7. Prostomial antenna not prolonged; body not unusually broad or depressed; smaller in size | 8 |

8. Branchiae increase in length posteriorly; posterior neuropodial hooks with a pointed hood *Aricidea lopezi*
8. Branchiae do not increase noticeably in length posteriorly; posterior neuropodial hooks without a hood . *Aricidea* nr *suecica*

Genus **PARAONIS** Grube, 1872

Paraonis gracilis (Tauber) 1879

Hartman, 1957, pp. 330-331, pl. 44, figs. 4, 5.

This species is present in nearly all basins, and perhaps throughout the benthos of southern California, in sediments of fine silt. Specimens are usually so very small and slender that they can pass through sorting screens or even be overlooked in microscopic sorting. Specimens taken from the basins usually have branchiae present from the fifth parapodium and they number only 6 to 12 pairs.

Paraonis gracilis is recorded from cosmopolitan areas (Hartman, 1957, p. 331) and it may be eurybathic as well. It occurs frequently in shallower bottoms of southern California (unpublished records).

Paraonis gracilis oculata Hartman, 1957

Hartman, 1957, pp. 331-332, pl. 44, figs. 1-3.

Specimens come largely from San Pedro, Santa Monica, Santa Catalina and Santa Cruz Basins and the San Diego trough. Like the stem species, they are smaller, have fewer than the typical numbers of branchiae. The prostomium has a pair of eyespots and so differs from that of the stem species found in the basins. This is known from eurybathic benthos of southern California.

Paraonis multibranchiata Hartman, 1957

Hartman, 1957, pp. 332-333.

This species has been found only in Santa Barbara Basin. It is characterized by having branchiae present from the sixth setigerous segment and they number 26 or more pairs.

Genus **ARICIDEA** Webster, 1879

Aricidea uschakovi Zachs, 1925

Hartman, 1957, p. 321, pl. 43, fig. 5.

This species has been taken in most of the subsill parts of the basins and may be expected to be widely distributed throughout the northeast

Pacific Ocean. It is the largest of the paraonids and is characterized by a very long prostomial antenna and a large, 3-lobed prostomium. Branchiae are present from the third setigerous segment and number 12 to 26 pairs.

The best represented sample comes from Santa Cruz Basin (Sta. 5925) with 25 specimens; another from San Clemente Basin (Sta. 5942) yielded 10; one from West Cortes Basin (Sta. 5940) contained 14 large individuals, and the outermost sample from Patton escarpment (Sta. 5938) contained 6. In southern California this species may have its greatest concentrations at basin depths; in shallower bottoms it is largely replaced by other species of the genus (see below).

Aricidea nr. *suecica* Eliason, 1920

Hartman, 1957, pp. 319-320, pl. 43, fig. 7.

Individuals come from Santa Barbara, San Pedro, Santa Catalina and West Cortes Basins; they usually number few to a sample and individuals are smaller than those from shallower depths. Most have small pigmented eyespots at the posterior margin of the prostomium, or they are more or less faded to invisible. The species is more widely known from western Europe, southern California and western Mexico (Hartman, 1957, p. 320).

Aricidea lopezi Berkeley and Berkeley, 1956

Berkeley and Berkeley, 1956, p. 542, figs. 1-3.

This was taken in San Pedro and West Cortes Basins and the Patton escarpment. Branchiae are first present from the fourth segment and number 17 to 18 pairs; they increase in length posteriorly, are thick at the base, and taper distally to a long, slender tip. In postbranchial segments the neuropodia carry hooks that are distally knobbed and covered with a long pointed cap (Berkeley and Berkeley, 1956, figs. 1-3).

This species has been found more abundantly on shelf and slope depths of southern California and was partly confused with *Aricidea* nr. *suecica* in an earlier report (Hartman, 1957, p. 319). From the latter it differs in being smaller, with an inflated instead of cylindrical thorax, and branchiae increase in length posteriorly instead of being uniformly large.

Aricidea lopezi is known more widely from western Canada in about 10 fm depths.

Subgenus **AEDICIRA** Hartman, 1957**Aricidea (Aedicira) ramosa** Annenkova, 1934

Aricidea ramosa Annenkova, 1934, pp. 657-658, fig. 3A.

Hartman, 1957, p. 327.

Single specimens come from Santa Catalina and San Nicolas Basins. In each the prostomial antenna is dendritically branched as originally described. The species is more widely reported from Arctic seas in 44 to 2400 meters (Annenkova, 1934).

Subgenus **CIRROPHORUS** Ehlers, 1908**Aricidea (Cirrophorus) aciculata** Hartman, 1957

Hartman, 1957, pp. 323-324, pl. 43, fig. 4.

Single specimens come from samples in San Nicolas and Tanner Basins. They are easily identified by the projecting acicular spines present in notopodia of postbranchial segments. The specimens are pale and less than 10 mm long. The species is more widely known from shallower bottoms of southern California (Hartman, 1957, p. 324).

Aricidea (Cirrophorus) furcata Hartman, 1957

Hartman, 1957, pp. 324-325, fig. 6.

This species was found only in a sample from Long Basin but it may be expected in other, shoreward bottoms. It is easily distinguished from *A. aciculata* (see above) in that the body is red or rust-colored instead of white; branchiae are more numerous and furcate setae are conspicuous. Aside from the type locality in the San Pedro area, it has been more extensively collected on shelf and slope depths of southern California (unpublished records).

Aricidea spp.

A specimen from Patton escarpment has deep yellow pigment dispersed over most of the body and the prostomium has eyespots. A posterior end from Tanner Basin has an anal end with a plaque. Both are too fragmented to characterize.

Family **SPIONIDAE**

Eight species in four genera have been identified. They may be recognized as follows:

Key to species

1. Branchiae present 2
1. Branchiae absent 5
2. Fifth segment modified and provided with thick hooks . . .
. *Polydora* sp.
2. Fifth segment not modified 3
3. Branchiae present on many segments . . . *Laonice sacculata*
3. Branchiae limited to a few anterior segments . . . 4
4. All branchiae bipinnately divided (Plate 9, fig. 1) . . .
. *Prionospio pinnata*
4. All branchiae cirriform *Prionospio cirrifera*
4. Branchiae partly pinnate, partly cirriform . . . *Prionospio* spp.
5. Prostomium with laterally directed horns at anterior end .
. *Spiophanes anoculata*
5. Prostomium without laterally directed horns . . . 6
6. Prostomium with a median antenna inserted between palpal
bases; genital spines present from neuropodium 15 . . .
. *Spiophanes fimbriata*
6. Prostomium without a median antenna; genital spines present
from neuropodium 10 *Spiophanes pallidus*

Genus **LAONICE** Malmgren, 1867**Laonice sacculata** (Moore) 1923

Spionides sacculata Moore, 1923, pp. 184-185.

A specimen from Santa Cruz Basin agrees with the original account in that the prostomium nearly lacks eyes and interrhamal pouches are first present from segment 30. Branchiae occur on setigerous segment 2 through about 50 segments. The dorsal transverse membranes are inconspicuous except over the notopodial lobes.

The type specimen, as *Spionides sacculata*, from Monterey Bay in 222 fms, has been reexamined. It measures about 57 mm long by 6 mm across and is posteriorly incomplete. The prostomium nearly or altogether lacks eyes. Lateral parapodial pouches are present from setigerous segment 29-32. A narrow median nuchal ridge extends back from the prostomium to segment 24. Branchiae number about 55 pairs, after which they diminish through another 10 segments and are absent from about segment 65. Hooded hooks are first present in neuropodia of segment 55; they replace most of the pointed setae and occur in transverse series; they are accom-

panied by one or 2 very long, curved, inferiormost genital spines which are finely pinate along their free length. Hooded hooks are distally bifid and have a rounded hood.

Laonice sacculata differs from *L. foliata* (Moore, 1923, pp. 182-183), first described from the shallow benthos of California, chiefly by lacking, instead of having, prostomial eyes. It may best be considered a variety of *L. foliata*. Its known geographic range is limited to California.

Genus **PRIONOSPIO** Malmgren, 1867

Prionospio pinnata Ehlers, 1901

(Plate 9, figs. 1-5)

Ehlers, 1901, pp. 163-164.

Prionospio alata Moore, 1923, pp. 185-186.

Berkeley and Berkeley, 1952, p. 30.

This species was taken in Santa Catalina and Velero Basins; another questionable record from Tanner Basin is more completely discussed below (under *Prionospio* spp.). Many more collections of much larger individuals come from shallower shelf and slope depths of southern California, and in spite of superficial differences, they are believed to represent a single, widely distributed, eurybathic species.

The original account by Ehlers (1901, p. 163) was based on a small individual from Chile, in 10 meters, in which 25 anterior segments measured 10.5 mm long and 1-1.5 mm wide. It was described as follows: Prostomium a triangular lobe, without antenna or eyes, laterally enclosed by the upturned membranous wings of the peristomium. Palpi are long and each base has a broad foliaceous membrane. The first 5 segments have dorsal and ventral postsetal lobes in which the dorsal one is oval, distally pointed, and larger than the corresponding ventral one. On segments 6 and 7 these lobes are smaller, and farther back they are increasingly reduced in size. Branchiae number 3 pairs, are very large (when not regenerated) and all are bipinnately divided. Neuropodial hooks are first present from the ninth segment. Tubes are thick and mud-walled.

These characteristics agree with those of *Prionospio alata* Moore (1923, p. 185) first described from off Point Pinos lighthouse in 56-57 fms, in sediments of coarse sand, shale and rock. Its type specimen measured 29 mm long by 1.6 mm wide and consisted of 52 segments. The prostomium is about five times as long as wide, has blunt anterior end and lacks eyes and antenna. The peristomium is prolonged forward and

forms conspicuous thin wings at the sides of the prostomium. Branchiae number 3 pairs and are entirely bipinnate. The first parapodial segment is rudimentary and has few setae. The next 4 segments have conspicuous foliaceous lobes which are reduced farther back. Hooded hooks are present from about neuropodium 20, at first few in a fascicle, and within 5 segments replace about half of the pointed setae; they alternate with pointed setae through about segment 52.

Specimens taken from basin and shelf depths of southern California agree with these accounts, but those from shallower bottoms are larger, usually have prostomial eyes, weakly to well developed, and are strikingly pigmented in life (those from basins are pale or translucent). The best pigmented specimens have 8 to 10 transverse bars of alternating black and yellow pigment on the branchial pinnae; this fades out in preservatives. A mud-walled or any other kind of tube has not been observed.

The diagnostic characteristics, as herein defined, are illustrated in the accompanying figures (Plate 9, figs. 1-5) based on a specimen from the upper end of Redondo canyon (Sta. 2193 in Hartman, 1955, p. 45). The anterior end has 3 pairs of large, bipinnately divided branchiae (Plate 9, fig. 1). A ninth parapodium, in anterior view, shows the arrangement of setae, hooks and genital spines (Plate 9, fig. 2). These spines are punctate along their free length (Plate 9, fig. 5). Hooded hooks are distally curved, have a large fang and are surmounted by 4 teeth in 2 rows (Plate 9, figs. 3, 4).

Prionospio pinnata has been reported from all major oceans and from shallow to eurybathyal depths (Fauvel, 1953, p. 324). In southern California its greatest concentrations are in shelf and slope depths and in sediments of olive-green silty muds.

***Prionospio* nr. *cirrifera* Wirén, 1883**

Berkeley and Berkeley, 1952, pp. 28-29, figs. 52, 53.

Specimens come from San Pedro and Santa Catalina Basins. A small one measures about 10 mm long by 1 mm wide. One has 6 pairs of slender, cirriform branchiae inserted on setigerous segments 2 to 7; another has 8 pairs of branchiae on setigerous segments 5 to 12, suggesting that a total of 11 pairs were originally present. The prostomium is broadest in front and approximately T-shaped; it is dorsally depressed and lacks eyes. A caruncle extends back to the end of the first or second segment. The peristomium forms a pair of lateral lobes at the sides of the prostomium.

The first segment is uniramous, provided with a pair of small neuropodial fascicles. The first 17 segments have slender, distally pointed setae only. Thereafter, hooded hooks are present in neuropodia, at first only one or two in a series, accompanied by pointed setae. By segment 31 there are 5 or 6 hooks alternating with as many long setae. The hooks have an unusually small terminal hooked end, covered by a long, hyaline, distally rounded hood.

These individuals differ from typical *P. cirrifera* Wirén (see Fauvel, 1927, p. 62, fig. 21) in their small size and reduction of prostomial eyes. The species is more widely known from arctic and boreal seas, and has been recovered from shallower seabottoms of southern California (unpublished records).

Prionospio spp.

A small specimen from Tanner Basin (Sta. 6346) with 56 anterior segments, measures 24 mm long. The peristomium lacks lateral wings. The prostomium has two minute eyes near its mid-length; it is widest at its anterior margin and forms a narrow caruncle extending back to segment 3. Branchiae number 3 pairs; the first are smaller and slenderer than the others and clearly bipinnate; the second and third pairs are much larger, broader and heavily fimbriated along their lateral margins, but not bipinnate.

Notopodial postsetal lobes of the first 5 segments are distally prolonged as thin, tapering lobes, with those of the second and third pairs the largest and longest. On the next few segments the postsetal lobe is still large and triangular, but it diminishes abruptly within a few more segments. Neuropodial hooks are first present at segment 18, at first one or two in a fascicle; they increase in number gradually to 10-12, alternating with pointed setae, accompanied by a ventralmost genital spine.

Another specimen from Patton escarpment (Sta. 5937) also lacks prostomial eyes or they are obscure black specks fading on preservation. Three pairs of branchiae occur on setigerous segments 3 to 5; another pair might have occurred on segment 2, bringing the total to 4 pairs. All but the last pair are thick, tapering and heavily ciliated along the outer edge; the last are pinnately divided only along the outer edge. Neuropodial hooks are present from segment 21; they gradually increase in number to form transverse series in posterior segments, where they are accompanied by alternating pointed setae and a ventralmost geniculate spine.

This individual may be compared with *Prionospio nova* Annenkova (1938) from North Japan Sea in 5-15 meters, which was described from

a short anterior end of 19 segments measuring only 8.0 mm long; it has all branchiae cirriform but the last, which are pinnate only along an outer edge. Postsetal lobes of anterior segments are broad at the base and taper to slender tips, and neuropodial hooks are not present before segment 19.

The specimens from Tanner Basin and Patton escarpment are characterized by having both pinnate and cirriform branchiae.

Genus **SPIOPHANES** Grube, 1860

Spiophanes fimbriata Moore, 1923

Moore, 1923, pp. 179-182.

Hartman, 1941, p. 290.

Laonice sacculata Hartman and Barnard, this volume, p. 52.

Numerous specimens were taken in San Pedro, San Nicolas, West Cortes, Velero and Tanner Basins. Largest individuals measure about 22 mm long by 2.8 mm wide and consist of 40 or more segments. The prostomium is depressed triangular, lacks eyes or has 2 to 4 very weakly developed small spots. There is a long, slender occipital antenna. The dorsal fimbriated folds are prominent on segments 24 to 29. Lateral, interrampal pouches are present from about segment 25 and continue back through many segments. Neuropodial hooks are first present at segment 15-19, and genital spines from segment 15, as a single, sickle-shaped, ventralmost seta.

The palpi are unique for having a double crenulated border along their entire length except at the thick base. The anal end terminates in a circlet of 12 long, slender filaments, some of which are bifurcated at the free end. The first 4 notopodial pairs are elevated above the others and have a long, triangular, distally tapering postsetal lobe. The first setiger has a large, recurved spine at the inferior end of the setal fascicle, its tip directed down and back. Similar spines, decreasing in size, are present through more posterior segments. Hooded hooks are tridentate, with the 3 teeth in a straight row.

Spiophanes fimbriata approaches *S. cirrata* Sars, reported from western Canada (Berkeley and Berkeley, 1952, p. 24), except that the latter has the frontal margin of the prostomium laterally prolonged and there are 4 large black eyespots; the nuchal ridge extends farther back than in *S. fimbriata*. The latter is known only from southern California, in moderate and basin depths.

***Spiophanes anoculata*, new species**

Spiophanes, unknown sp., Hartman and Barnard, this volume, p. 47.

This species comes from Santa Catalina Basin (Sta. 4742), San Nicolas Basin (Sta. 5931) and Patton escarpment. Specimens are small, measure less than 15 mm long. The prostomium is triangular, broadest in front, and has a pair of long, slender lateral processes or horns at the frontal margin. There are no eyes or several inconspicuous dark specks are visible at the sides, between the palpal bases. A median antenna is lacking. Long, brown, diverging nuchal organs arise from behind the palpal bases and are continued through 2 segments; they are conspicuous in fresh specimens but fade on preservation.

The first segment is biramous; its notopodium is reduced to a slender, papillar lobe closely appressed to the front of the neuropodium. It is provided with a small fascicle of very long, slender setae. The neuropodium is much larger, has a triangular postsetal lobe slightly larger than that of the next segment, and a spreading fascicle of many long, pointed setae and a thick, sharply curved, brassy yellow geniculate spine. Neuropodial postsetal lobes of segments one to five are thin and foliaceous; thereafter they are increasingly fleshy and become thick and pad-like through 9 segments. These have conspicuously colored glandular areas (red in fresh specimens, faded in older ones).

Neuropodial hooded hooks are first present from the postglandular region, or segment 15. Postsetal lobes of anterior segments are broad and triangular, while those of postglandular segments are slender and cirri-form.

Spiophanes anoculata differs from other species of the genus in having prostomial horns, and eyes absent or nearly so; the first segment is very unequally biramous, with the notopodium reduced to a papilla. The first 5 segments differ from the next 9 in having foliaceous parapodial lobes.

This is known only from the outer series of basins and the Patton escarpment; it is considered a deep water or basin form.

***Spiophanes pallidus*, new species**

(Plate 10, figs. 1, 2)

The type is from East Cortes Basin (Sta. 5943); others are from San Clemente and questionably San Nicolas Basins. Length is 11.3 mm for 24 anterior segments. The prostomium is broadly T-shaped, lacks lateral horns and is broadest at its frontal margin; it extends posteriorly between the palpal bases and narrows to a caruncle extending back to the

end of the second setigerous segment; there is no occipital antenna (Plate 10, fig. 1). Eyes are absent or obscure as a pair of spots located at the sides, between the palpal bases. Notopodial postsetal lobes are very conspicuous from the first segment as large, broadly foliose lobes behind the setal fascicle; they are similar through 14 segments but those of the first 6 segments are largest, distally acuminate and they decrease in size posteriorly. These lobes have a broad base continued across the middorsum as a dorsal fimbriated organ.

The first 9 segments have only slender, distally pointed setae in both notopodia and neuropodia; the fascicles are full and tufted. A thick, slightly curved genital spine is present in inferiormost position of the series from neuropodium 10, and one or two such spines occur in all segments farther back. Hooded hooks are first present at segment 20-22, accompanied by longer, distally pointed setae and a ventralmost genital spine. They number 6 to 8 in a transverse series; distally they have a large fang surmounted by a tuft of slender spines in spreading series (Plate 10, fig. 2).

Spiophanes pallidus differs from other species of the genus in having a T-shaped prostomium without lateral horns or antenna; eyes are nearly or altogether absent. The anteriormost postsetal lobes of notopodia are foliaceous and continued across the middorsum as transverse fimbriated organs.

The species has been recovered only in East Cortes, San Clemente and questionably San Nicolas Basins; it is thus considered a basin form.

Spiophanes spp.

Specimens perhaps attributable to one or the other of the species named above come from other outer basins; they are too fragmentary to assign specifically. Additional collections are needed to characterize them.

Genus POLYDORA Bosc, 1802

Polydora spp.

Small, juvenile, immature or vegetative (non-reproductive) individuals come from several stations in San Pedro Basin; they may represent species more typically occurring in shallower bottoms of the shelf or slope. Species of this genus are usually shelf forms.

Family MAGELONIDAE

Genus **MAGELONA** Müller, 1858**Magelona pacifica** Monro, 1933

Monro, 1933, pp. 1048-1049, fig. 2.

Hartman, 1944, p. 320.

A specimen questionably referred to this species comes from Santa Catalina Basin. The prostomium has frontal horns. The first 8 thoracic notopodia have a dorsal cirrus, located above a foliaceous notosetal lamella; the corresponding ventral lamella is much smaller. In abdominal segments the postsetal lobe is large, broad and lanceolate.

The species has been taken more frequently from shallower benthos of southern California; it is more typically a shelf and slope species. It has a known geographic distribution that extends south to Panama, in shallow depths.

Magelona sp.

Two specimens from Patton escarpment are unique for having a rose-colored pigment forming a collar behind the prostomium and extending to the first setigerous parapodia. The prostomium lacks frontal horns. Dorsal and ventral cirri are long, distally tapering through the first 8 segments, but surpassed by the setal tips. The modified setae of the ninth segment are abruptly longer than others but similar in shape.

Family CHAETOPTERIDAE

Genus **PHYLLOCHAETOPTERUS** Grube, 1863**Phyllochaetopterus prolifica** Potts, 1914

Berkeley and Berkeley, 1952, pp. 63-64, figs. 131, 132.

A fragment comes from Santa Catalina Basin. This is typically a shallow water species, especially abundant on rocky or rubbly bottoms. The tubes are typically long, cylindrical, more or less opaque, and irregularly sinuous. It has a known geographic distribution extending from western Canada to southern California. It is seldom in depths beyond 250 fms.

Phyllochaetopterus limicolus, new species

(Plate 10, figs. 3-5)

Many collections are available; they come from muddy bottoms of nearly all basins and the San Diego trough. The type was selected from

sill depth between San Pedro and Santa Monica Basins in about 450 fm depth, in sediments of fine green mud.

Tubes are long, cylindrical, translucent, unbranched, and limp to somewhat stiff. When empty they resemble pale, yellowish-green algal strands or soaked straws. They are not annulated or only vaguely so and measure 250 mm or more long. The enclosed animals are much shorter, about 20 mm long and 2 to 3.5 mm wide. Most specimens are recovered in fragmented pieces, the breaks occurring usually behind the thoracic and in abdominal segments.

The body consists of 3 regions, a short anterior one with 9 setigerous segments, a median one with only 2 segments, and a posterior one with many segments. These regions are best marked by the character of the parapodia. In the anterior region they have conspicuous notopodial lobes with setae in vertical projecting series. The fourth notopodium has a single heavy dark spine in either side. Notopodia of the middle region are frilled, deeply bilobed and extend across the middorsum as a delicate transverse fold. The posterior or third body region has inconspicuous parapodial lobes (Plate 10, fig. 3). Notopodia are slender, cylindrical, and neuropodia are low, divided transverse ridges.

The dorsum of the anterior region is flat and broader than the rest of the body. The large peristomium extends well forward and obscures the much smaller prostomium, which is visible as a small, blunt lobe between the palpal bases; it lacks eyes. The long, paired grooved palpi are inserted at the sides of the transverse oral slit, and within the bases of the first pair of notopodia. Immediately behind and at the sides are small, cylindrical paired antennae; they are shorter than the prostomium is wide.

On the ventral side of the body the peristomial ring and the first 2 setigerous segments are chalky white or pale. A dark tawny or brown band extends across the third to fifth segments; this is followed by a chalky white patch extending from between segments 6 to 8; thereafter the body is greenish or dark grayish green.

The parapodia of the first 4 segments are directed laterally; thereafter they are slenderer and directed dorsally. The first pair are smaller than others of the thorax; there is a gradual increase in size through 9 anterior segments. Each notopodium has a transverse fascicle of limbate setae in which the uppermost are slenderest and the inferiormost are shortest and broadest; they terminate in pointed tips. In addition, the

fourth has a heavy brown spine (Plate 10, fig. 4) in which a heavy core extends through the distal end.

The 2 segments of the middle region (=segments 10 and 11) are short and have aliform parapodial processes. The first one conceals much of the dorsal side of the ninth segment, and the second one partly covers the one in front. Their notopodia are deeply trilobed, foliaceous, and the uppermost lobe carries the deeply embedded acicular setae and extends across the middorsum as a thin membranous fold. The aliform lobes of segment 10 are broader though slightly shorter than those of 11, but similar in other respects. In both these segments, the upper and lowermost lobes are the largest and the smaller, middle lobe is a lateral process originating from the uppermost. A heavy flange of cilia separates the uppermost from the lower division. A small round lobe or lateral organ, separates the notopodium from the ventrolateral neuropodium. The uncini are in transverse series, number nearly a hundred in a parapodium. Each is a thin, approximately triangular plate with a finely dentate margin in which the serrations number about 50 and the basal tooth is the largest (Plate 10, fig. 5).

The third body region differs abruptly from the second one in having parapodia consisting of slender, erect notopodia and low, transverse neuropodia without winglike processes. The first is only slightly longer than the second segment and others are similar to the second. The tall, slender notopodia are at the level of greatest constriction between successive segments, and the transversely divided neuropodial ridges are on the ventral side of the inflated part of the segment. Notopodia are directed dorsolaterally and terminate in a small knob; they are penetrated by 2 or 3 slender rodlike setae which project from the tip for a short distance. Neuropodia consist of low ridges with transverse series of uncini like those in middle segments, but smaller.

Phyllochaetopterus limicolus differs from other species of the genus, in which the middle region of the body consists of only 2 segments and the modified fourth segment has single large spines, in that the anterior region consists of only 9 segments.

It has been found most abundantly in San Pedro and Santa Monica Basins, associated with a serpulid, *Protis pacifica* (see below), and a pelecypod, *Cyclopecten zephyrus* Grau, but the largest or best developed specimens occur at sill depths or above.

Genus **TELEPSAVUS** Costa, 1861**Telepsavus costarum** Claparède, 1870

Fauvel, 1927, p. 82, fig. 28.

Berkeley and Berkeley, 1952, p. 63, figs. 127-130.

A few small fragments were taken in San Pedro and Santa Cruz Basins. This is more typically a shallow water species, known from cosmopolitan areas. It is characterized by a very slender, translucent, neatly annulated tube measuring 1 to 2 mm across and 100 mm or more long. The modified fourth segment has a single large dark spine on either side.

In southern California, *Telepsavus costarum* reaches its greatest concentrations on shelf and upper slope depths, in sediments of sandy silts.

Family CIRRATULIDAE

Six species in 4 genera are represented; they may be identified according to the following key.

Key to species

- | | |
|---|--------------------------------------|
| 1. Long tentacular filaments (=branchiae) numerous | 2 |
| 1. With a single tentacle inserted anteromedially | <i>Cossura</i> spp. |
| 2. Setae entirely slender, limbate and distally pointed | 3 |
| 2. Setae partly acicular or spinelike | 4 |
| 3. Body larger, not moniliform, inhabiting tubes (Plate 11, fig. 1) | |
| | <i>Tharyx tessellata</i> |
| 3. Body smaller, moniliform (Plate 12, fig. 2), without tubes | |
| | <i>Tharyx monilaris</i> |
| 4. Neuropodial spines distally entire and acicular | 5 |
| 4. Neuropodial spines distally finely serrated | |
| | <i>Caulleriella gracilis</i> |
| 5. Neuropodial spines not present before middle region of body; prostomium usually without eyes | <i>Chaetozone spinosa</i> |
| 5. Neuropodial spines first present at segment 24 and notopodial spines from about segment 64 | <i>Chaetozone</i> nr. <i>spinosa</i> |
| 5. Neuropodial spines present in most or all body segments; prostomium with or without eyespots | <i>Chaetozone corona</i> |

Discussion—Three closely related genera, *Chaetozone*, *Caulleriella* and *Tharyx*, are represented in the basins in considerable numbers of individuals. They usually come up as fragments from deep grabs and are to be distinguished from one another only by examination of micro-

scopic parts. Species of these three genera are characterized by having a pair of long palpi inserted on the dorsal side and in front of the first parapodial segment; the palpi are usually broken off near the base in collected samples. Branchiae number no more than a single pair to a segment, when present, and are inserted near the notopodial base; these too may be missing in preserved collections. In species of *Tharyx* all setae are distally pointed and hairlike. In *Chaetozone* the acicular spines of posterior parapodia tend to form transverse rows encircling the segments (resembling cinctures); whereas in species of *Caulleriella* the acicular fascicles are more widely separated from one another medially. Lacking posterior segments of any of these, the species can either be confounded or unidentifiable. The interpretations indicated below are largely based on specimens considered nearly or altogether entire.

Genus **CHAETOZONE** Malmgren, 1867

Chaetozone spinosa Moore, 1903

Moore, 1903, pp. 468-470, pl. 26, figs. 73, 84.

Okuda, 1939, p. 238, fig. 11.

Specimens come from San Pedro, Santa Catalina, Tanner, West Cortes, San Clemente and Long Basins and from Patton escarpment. They measure only about half as large, or less than, those first described from Sagami Bay, Japan, in 305 meters; these were 65 mm long by 5 mm wide and consisted of 112 segments.

The prostomium is pointed in front and lacks eyes. Acicular spines are first present from about segment 70, and in far posterior segments they form complete paired series so that separation between notopodium and neuropodium is obscured; there is, however, a broad middorsal and a midventral space. Acicular spines are yellow, slightly curved and distally entire.

Two specimens from Patton escarpment (Sta. 5937) differ from typical ones in that neuropodial spines are first present at segment 24, and in notopodia at segment 64. The parapodial spines in posterior segments encircle the body. They are acicular, slightly curved and distally entire.

Chaetozone spinosa is known from both sides of the north Pacific Ocean, in moderate to basin depths.

Chaetozone ?corona Berkeley and Berkeley, 1941

Chaetozone spinosa corona Berkeley and Berkeley, 1941, pp. 45-46.
Hartman, 1955, p. 171.

This species was collected in San Pedro, Santa Catalina and Santa Cruz Basins. These individuals differ from those taken from shallower depths (Hartman, 1955, p. 171) in that prostomial eyes are nearly or altogether lacking. Yellow acicular spines, alternating with slender longer capillary setae, are present in neuropodia and notopodia from the first or second segment and continue throughout the rest of the body.

C. corona differs from *C. spinosa* (see above) in being larger, paler, and having parapodial spines in anterior segments instead of lacking them. *C. corona* is elevated to specific rank for this reason.

The species is more abundantly present in shallower bottoms of southern California and has been previously recorded from the San Pedro area (Hartman, 1955).

Genus CAULLERIELLA Chamberlin, 1919***Caulleriella gracilis* (Moore) 1923**

Tharyx gracilis Moore, 1923, p. 187.

Berkeley and Berkeley, 1950, p. 57.

Berkeley and Berkeley, 1952, p. 37.

This species was taken only in Santa Catalina Basin. Many more come from shallower slope and shelf depths of southern California (unpublished records). Length of mature specimens is 29 mm and width about 1 mm. Segments number about 110. The body is slender, barrel-shaped in front through about 40 segments, then slenderer, with transverse grooves marking the segmental intervals. The tail end tapers posteriorly. The prostomium is acutely pointed, longer than wide, and lacks eyes. Palpi are inserted dorsally, on the first setigerous segment and immediately above and in front of the first parapodial pairs.

Branchiae are numerous, inserted immediately above and slightly behind the notopodial papillae; they are first present as a single pair on the first parapodial segment. Notopodial setae are slender and capillary in anterior segments. In postmedian segments they are partly replaced by 2 or 3 thicker, acicular spines. Neuropodial setae are in transverse series of 7 to 12; they are thicker and shorter than the corresponding notopodial setae and alternate with blunt, acicular spines. Highly magni-

fied, they are distally slightly curved and terminate in a tip with 3 or more shallow serrations.

Caulleriella gracilis was first described off Santa Catalina Island in over 2000 fms. It is more widely distributed in shallow bottoms of western Canada (Berkeley and Berkeley, 1950) and southern California.

Genus **THARYX** Webster and Benedict, 1887

Tharyx tessellata, new species

(Plate 11, figs. 1-4)

Numerous specimens were taken in San Pedro, Santa Catalina, San Nicolas, East Cortes and Long Basins and from Patton escarpment and San Diego trough. The type was selected from Sta. 5563, 13 miles from Point Conception light, in a depth of 39 fms, sediments of green mud. Many other specimens come from other shelf and slope depths of southern California.

Length of a larger specimen is 50-55 mm; width is 2 to 2.5 mm; segments number 200 or more and are closely crowded. The prostomium is long triangular and lacks eyes. The first 3 segments form the buccal region; they are smooth complete rings without parapodia or setae. The first 33 setigerous segments are very short and crowded; they have lateral biramous parapodia in which notopodia and neuropodia are separated by a short distance, about equal to that of the length of the setal ridge.

In many specimens, the long paired palpi are broken off near the base; their place of attachment is in the segmental groove preceding the first setigerous segment, in dorsolateral position and above the notopodial position (Plate 11, fig 2). The branchiae are long lateral filaments, emerging from the body wall directly above the notopodial base; there are never more than a pair to a segment and they occur irregularly, so that one or both of a pair are absent from some segments.

Notopodial setae are very long, slender, hairlike; they occur in full dense tufts through anterior and middle regions of the body and diminish in number and length in far posterior segments. The accompanying neuropodial setae are shorter and fewer in number in median and posterior segments, where they are also slightly geniculate and distinctly serrated at the cutting edge (Plate 11, fig. 4). In posterior parapodia the upper fascicle of setae includes about 10 to 15, and the lower one about 10 to 12.

In preserved individuals the posterior end of the body is characteristically inflated (Plate 11, fig. 3) and terminates in a constricted pygidial ring with dorsal anal pore.

Mature, ovigerous individuals are frequently taken in a closely adhering mucoid tube with tessellated lateral processes, through the ends of which the branchial filaments extend. These tubes extend the full length of the body or beyond, and the anterior end of the body seems to be extensile from it (Plate 11, fig. 1). Immature stages have thin, less developed mucoid sheaths which are easily torn away. The specific name refers to the character of the tube.

Tharyx tessellata may be compared with *Tharyx* sp. Berkeley and Berkeley (1941, p. 45) from southern California, which it resembles in the character of the neuropodial setae with serrated blade. However, in the latter the anterior achaetous region has 4 segments and the fifth segment is the first setigerous.

T. tessellata is one of the most abundant species of polychaetes in the basins of southern California, as well as on the slope and shelf.

***Tharyx monilaris*, new species**

(Plate 12, figs. 1, 2)

Specimens so identified come from Santa Catalina, Tanner and questionably San Nicolas and Long Basins. The species is described from specimens from shallower depths, where it is expected to have its most abundant distributions. The type is selected from Sta. 4723, off Newport Beach, in 128 fms, silt. It is ovigerous and probably mature. The body is very slender, moniliform in most of its length, and measures about 18 mm long. Other similarly developed individuals are somewhat smaller or larger but all are distinctly moniliform in median and posterior segments. Segments number 100 or more. The prostomium is acutely pointed triangular; a pair of spots near its base and at the sides, may represent eyespots. The buccal region is inflated, resembling the far posterior end in which the segments are closely crowded and also inflated (Plate 12, fig. 1).

Parapodia are lateral throughout, with setal fascicles emerging from a slightly elevated parapodial papilla. All setae are slender, distally pointed, hairlike; neuropodial setae are shorter than the corresponding dorsal ones but otherwise similar. The lateral branchiae are inserted adjacent to the notopodial lobe. In ovigerous segments they are near the posterior end of the segment, behind the inflated region.

The first 15 setigerous segments are short and closely crowded. Abruptly thereafter they are longer and cylindrical to beadlike.

A fully mature, epitokous individual from Sta. 5586, 10.3 mi from

Santa Barbara Point Light, in 37 fms, in sediments of green clay, shows the maximum development of ovigerous development, and the relations of setae and branchiae (Plate 12, fig. 2). It is possible that individual segments are shed as ova mature, and that gonadial development proceeds more anteriorly.

Tharyx monilaris is at once distinguishable from other species of the genus by its small size; setae are entirely slender and hairlike; both anterior and posterior ends are inflated, and median body segments are moniliform. It has been found generally distributed in shelf, slope and basin sediments, and is often present with *T. tessellata* (unpublished records).

Genus **COSSURA** Webster and Benedict, 1887

Cossura candida Hartman, 1955

Hartman, 1955b, pp. 44-45, pl. 1, figs. 1-5.

Many collections come from San Pedro, Santa Catalina, Santa Cruz, San Nicolas, San Clemente, East Cortes and Velero Basins, and from San Diego trough. The single median tentacle is inserted on the third setigerous segment. The species is more widely known from shallower ocean bottoms off southern California.

Cossura sp.

A small dark red specimen was taken in Santa Catalina Basin and a similar one in San Nicolas Basin. Both lack posterior ends; their specific determination is not possible.

Family **FLABELLIGERIDAE**

Three species in three genera are represented; they are distinguishable according to the following key.

Key to species

1. Setae of first several segments form a cephalic cage *Pherusa* sp.
1. Without a cephalic cage 2
2. Surface epithelium smooth; some setae falcigerous (Plate 14, fig. 1) *Brada glabra*
2. Surface epithelium densely papillated (Plate 13, fig. 1); setae distally pointed (Plate 13, fig. 2) *Ilyphagus ilyvestis*

Genus **PHERUSA** Oken, 1807**Pherusa** sp.

Small or fragmented specimens, presumably vegetative stages, come from San Pedro and Santa Catalina Basins. The surface epithelium is lightly papillated and the long setae of the first few segments form a cephalic cage. They may be representatives of one or more of the several species known to occur in shallower ocean bottoms off southern California.

Genus **BRADA** Stimpson, 1854**Brada glabra**, new species

(Plate 14, figs. 1, 2)

The type specimen is from San Nicolas Basin (Sta. 6341) and others are from San Nicolas and Santa Catalina Basins and from Patton escarpment. More numerous individuals were taken in shallower sea bottoms of southern California (unpublished records).

Specimens are sometimes recovered from dead *Cadulus* (scaphopod) shells in which they lie in a nearly straight position, surrounded by silt. The body is slightly depressed cylindrical, widest at the anterior three-fifths and abruptly narrower in the posterior two-fifths. It tapers gradually posteriorly but both anterior and posterior ends are bluntly rounded, with the anterior end turned ventrally and the posterior directed dorsally. There is no cephalic cage. The type measures 6 mm long by 0.6 mm wide and consists of 33 setigerous segments. Some measure to 8 mm long and are somewhat larger, but most are smaller. Segmental lines are visible externally but there are no constrictions and there is no separation into body regions. The surface epithelium is smooth, without any papillae, and the parapodial ridges are visible only as papillae from which the setal fascicles project. The midventrum is marked by a longitudinal shallow groove which indicates the location of the neural cord.

The prostomium is a small rounded lobe without eyes or visible appendages. It is followed by the first setigerous segment, which is narrower and has shorter setae than those following. All parapodia are biramous, with the rami widely separated from each other. A small subspherical interramal papilla is located near the dorsal ramus and present in all parapodial segments.

Anterior setae are mainly slenderer, distally pointed, numbering 2 or 3 in a ramus. The dorsal and ventral ones resemble one another. In

median segments the innermost one is replaced by a thick, falcate spine (Plate 14, fig. 1) accompanied by a long, slender seta like those in anterior segments. In far posterior segments, the setal ridges are gradually shoved dorsolaterally from a strict lateral position. A pair surround the broad, dorsally directed terminal anal pore. The parapodia of the last 3 segments are similar to others except that the spines are thicker (Plate 14, fig. 2), forming an anal armature.

Brada glabra differs from other species of the genus in totally lacking epithelial papillae, except for the interramal one. Parapodia are reduced to setal ridges from which the spinelike setae project. It is known only from southern California, in moderate to basin depths, and in sediments of silt.

Genus **ILYPHAGUS** Chamberlin, 1919

Ilyphagus ilyvestis, new species

(Plate 13, figs. 1-3)

Two specimens were taken in Long Basin (Sta. 6351). They grossly resemble a gray, flat, compacted and elongated mudcake. They measure to 14 mm long by 6.2 mm wide. The general shape is reminiscent of a very flat *Brada*, densely clothed above and below with very long, slender papillae; these are thickly coated with mud for half their length and exposed at the distal ends. The body is truncate in front and broadly rounded behind (Plate 13, fig. 1); it lacks a cephalic cage. The prostomial parts are fully retracted and could not be distinguished by dissection. The parapodial parts, largely obscured by the densely mud-coated papillae, seem to be inconspicuous low mounds from which the setal fascicles project in biramous arrangement. The number of segments has not been accurately determined but may not exceed 40.

Parapodial fascicles are lateral, visible as glistening white or straw-colored, very fine, slender, distally pointed hairs; there are no falcigers or hooks of any kind. Seen under high magnification, they are closely cross-barred for all or most of their length, with the bars wider than long and similar throughout the area of barring. Neuropodial setae are coarser and fewer than notopodial ones; in the posterior half of the body they number about 5 in a fascicle. Each is a simple rod, expanded subdistally to a bladelike part and tapering to a slender filament (Plate 13, fig. 2). Notopodial setae are about twice as numerous, extend farther distally, and are slenderer, similarly cross-barred and taper distally to long slender ends (Plate 13, fig. 3).

Ilyphagus Chamberlin was erected for 3 species, all originating in deep water. *I. bythincola* Chamberlin (1919b, p. 402) was taken off western Mexico in 1380 fms; *I. ascendens* Chamberlin (1919b, p. 403) off the Galapagos Islands in 633 fms, and *I. pluto* Chamberlin (1919b, p. 403) off Peru in 2845 fms. The types are in the United States National Museum, where they have been reexamined. They agree with one another mainly in that they are densely coated with long papilla encrusted with gray mud. The setae are long, slender and distally entire; all are cross-barred along their free lengths. None of the specimens has the cephalic structures extended and all are too brittle to dissect.

I. bythincola, the genotype, is a very flat, depressed, solelike form; it is oval in shape, broadly rounded at either end and measures to 50 mm long. Neuropodial setae are much coarser than notopodial ones and they taper distally, terminating in a long, fine, straight or slightly curved tip. On the holotype specimen, most of the setae have been broken off at the base, but those that remain are as originally described. Parapodia are lateral or ventrolateral in position. Neuropodial setae are about four and a half times as thick as notopodial setae but a little less than half as long. The annulations of notopodial setae, near the tip, are about as wide as long, and increase to five times as wide as long at the base. In neuropodial setae the proportions differ in that the bars are two and a half times as wide as long near the tip, and about five times as wide as long at the base. All setae have distal tips that are slender and pointed.

I. ascendens is similarly thickly covered with papillae on dorsal and ventral sides, encrusted with mud to near the tips of the papillae. The general shape of the body is that of a slightly depressed cucumber measuring 55 mm long. A pair of conspicuous parapodia at the anterior end, dorsolateral in position, retains a very long seta that extends distally, back to the end of the body; bases of other setae, perhaps similar, form an oblique series numbering about 6 on a side, with the medialmost in posterior position and gradually extending forward to the outermost setae. The setae of this first segment are the longest and thickest of any retained on the specimens. This feature sets the species apart from others ascribed to the genus. All other setal fascicles can be seen only in ventral view of the body. The neuropodial ridges form paired series of transverse rows, at first in longitudinal series with the first parapodium (best seen in frontal view of the body) and gradually approaching medially to form nearly semicircular series at the posterior end of the body. These

setal ridges are about as far from those of the pair as the distance from the ridge to the sides of the body.

Typical notopodial setae are very fine, short, pale, and as first described. Neuropodial setae are dark brown, with the anterior ones much coarser than the posterior (based on the setal stumps which alone remain on the specimens).

I. pluto bears no resemblance to the other two species except that it too is covered with long slender papillae thickly coated with clay silt, forming balls around the papillar filaments. The body is subcylindrical in shape, abruptly narrowed at one end and truncate at the other; it measures 42 mm long by 11.5 mm wide. A most unique feature is the circlet of 20 fleshy processes surrounding a flat cone with a pore near the center. Each process is a tricuspidate structure, with a double row of three elevations in quadrate arrangement, and the outer side slightly wider than the inner one. The surface epithelium, medially beyond this papillated end, is flaccid for about a fourth of the length of the body, and thereafter abruptly heavily papillated. The other end of the body tapers to a narrowed region with a pore at the subdistal end. I have been unable to distinguish which pore is anterior and which posterior. Chamberlin (1919, p. 403) considered the papillar end anterior and thus oral. The setae, now all lost, were described as long, heavy, flattened along their length and moderately curved at the tip.

I. hirsutus Monro (1937, p. 304) was described from the South Arabian Sea in 3385 meters. It is shaped like an *Echiurus* and is densely covered with long, cirriform papillae. Segmentation is revealed only by the serial arrangement of the setal bundles.

I. coronatus Monro (1939, p. 130) was named from the Antarctic Ocean in 1266 meters. It measures 42 mm long and 7 mm wide for 18 setigerous segments. The body is flaccid and sacklike, externally covered with long, cirriform papillae, and coated with mud. A cephalic cage is formed by setae of the first setigerous segment and these setae are about half as long as the body. The setae of the second segment are also prolonged and form part of the cage. This species has a pair of massive grooved palpi and about 10 thick, cylindrical branchiae (extruded from the oral cavity). Notopodial setae are slender, cross-barred and capillary. Neuropodial setae are shorter, thicker and obliquely striated, and end in long, tapering tips; some are ornamented with rows of thick hairs near the tips.

As currently known, these species comprise the genus *Ilyphagus*. It is at once clear that they may be less closely related to one another than indicated. *I. coronatus* alone is said to have a cephalic cage. *I. pluto* has a unique circlet of papillae, lacking in all of the others. *I. ascendens* diverges from the others in having its parapodial ridges on the ventral side of the body. *I. bythincola* and *I. ilyvestis* are flat and depressed; *I. ascendens* is less depressed, and *I. pluto*, *I. coronatus* and *I. hirsutus* are subcylindrical in shape. In most the cephalic structures are either not known or only incompletely so. All of the species are known only from abyssal depths and limited to the eastern Pacific Ocean, the Arabian Sea and the Antarctic Ocean.

Family SCALIBREGMIDAE

Genus **SCALIBREGMA** Rathke, 1843

Scalibregma inflatum Rathke, 1843

Berkeley and Berkeley, 1952, p. 58, figs. 119-121.

Fragments come from San Pedro and Long Basins. They are atypical in that the parapodial bases are prolonged and cylindrical, whereas in specimens from shelf and slope depths of southern California they are short.

The species has a known cosmopolitan distribution, chiefly in shelf and slope bottoms of moderate depths.

Family OPHELIIDAE

Genus **OPHELIA** Savigny, 1818

Ophelia sp.

Small, immature or vegetative stages were taken in Santa Catalina, San Nicolas and East Cortes Basins. They measure only a few mm long. They may be representatives of the cosmopolitan *O. limacina* (Rathke), well known from shallower depths of the northeast Pacific Ocean.

Genus **AMMOTRYPANE** Rathke, 1843

Ammotrypane pallida, new species

(Plate 14, fig. 3)

The type lot with 2 specimens comes from San Nicolas Basin in 400 fms (Sta. 3031). One is ovigerous and has proboscis and nuchal organs

fully everted. It measures 14 mm long, about one mm wide and consists of 27 setigerous segments; there is no anal tube. Another specimen from Long Basin measures 22 mm long and also has 27 segments. It resembles those of the first lot except that pharynx, nuchal organs, and palpode are not extended.

The prostomium is longer than wide, conical, and terminates in front in a slender, conical or elongated palpode; there are no eyespots. The mouth is at the posterior ventral position, in line with the nuchal organs and midventral. This region is set off from the first segment by a transverse line but no segmental groove. The first parapodial segment is the first visible one; it has lateral parapodia which are smaller than those on successive segments. Others increase gradually in size and resemble short, papillar lobes from which the long setal fascicles extend. The last 4 parapodial segments are shorter, somewhat crowded, and followed by an anal ring with a dorsal anal pore; there are no anal cirri or tube.

Branchiae are present from the second parapodial pairs to the fifth last segment and number 22 pairs. They are long, slender, cirriform processes throughout (Plate 14, fig. 3). A broad, neural groove extends throughout the length of the body; it is bounded on either side by ridges marking the strong muscular bands.

Setae are entirely slender, hairlike and project from the parapodia in sparse, laterally directed fascicles. In the type specimen, and seen by dissection in other specimens, the pharynx is observed to be a smooth, ventrally directed epithelial pouch adorned with a series of 16 long cirri arranged in a semicircle (Plate 14, fig. 3). This feature may distinguish the species from others of the genus. The posterior region contains large ova, seen through the surface epithelium.

A. pallida resembles *A. galathea* Kirkegaard (1956, p. 71) from the Banda trench in 7250-7290 meters; both lack an anal tube. In the latter, however, the body consists of 30 setigerous segments and branchiae are present on all segments but the first one; the proboscis is not modified as in *A. pallida*. Another abyssal species is *A. nybelini* Eliason (1951, p. 135) from the North Atlantic Ocean in 4504-4600 meters. It measures 48 mm long by 2 mm wide and consists of about 45 segments, and has a long anal tube.

Ammotrypane pallida is known only from San Nicolas and Long Basins and may be regarded as a deepwater form.

Other small, immature or vegetative specimens of *Ammotrypane* were taken in Santa Catalina and San Pedro Basins; these were earlier

(Hartman and Barnard, this volume, p. 44) reported as *A. aulogaster* Rathke, a species which is known to occur in shallower bottoms of southern California.

Genus **POLYOPHTHALMUS** Quatrefages, 1850

Polyophtalmus translucens, new species

The type specimen is from Long Basin (Sta. 6349) and two others are from Patton escarpment. The body is pale, translucent and measures 7.2 mm long for 18 setigerous segments. It resembles a nematode worm in that the shape is cylindrical, smooth, glistening and slightly coiled. It has a pair of lateral longitudinal grooves, and setal tufts extend out from the sides, at segmental intervals. There is no color except for the nuchal organs, near the posterior end of the prostomium; these are rust colored. The prostomium is long and acutely pointed in front; it terminates in front in a subspherical palpode.

Parapodia are biramous, have notopodial and neuropodial setae in discrete fascicles but those of a pair close together. The upper are about twice as long as the lower setae and all extend laterally in spreading tufts. The posterior end terminates in a slightly constricted collar with terminal pore but there is no funnel.

Elongate oval ova are present in median segments from 2 or 3 to 8 or 9 or later segments.

Polyophtalmus translucens differs from the shallow water or intertidal *P. pictus* Dujardin in that the body altogether lacks pigment, it has only 18 instead of 27 to 28 setigerous segments and the posterior end is presumed to lack an anal tube. *P. translucens* is known only from Long Basin and Patton escarpment and is believed to be a deepwater species.

Family STERNASPIDAE

Genus **STERNASPIS** Otto, 1821

Sternaspis fossor Stimpson, 1854

Berkeley and Berkeley, 1952, pp. 59-60, fig. 123.

Small immature or vegetative individuals come from Santa Catalina, Long, questionably San Nicolas Basins and Patton escarpment. The species is commonly encountered in shelf and slope muddy bottoms of southern California, and has been recorded from southern California in depths of 36 to 667 fms (Moore, 1909 to 1923). It is more widely distributed throughout the northern hemisphere (Berkeley and Berkeley, 1952, p. 60).

Family CAPITELLIDAE

At least seven species in five genera are represented. They may be identified by the following key.

Key to species

1. Thorax consisting of 8 setigerous segments
 capitellid, unknown sp.
1. Thorax consisting of 10 setigerous segments
 *Mediomastus glabrus*
1. Thorax consisting of 11 setigerous segments 2
1. Thorax consisting of 12 setigerous segments
 *Leiochrides hemipodus*
2. All thoracic setigerous segments provided only with pointed setae 3
2. Thoracic parapodia provided with pointed setae and hooks
 *Neoheteromastus lineus*
3. Last 3 thoracic neuropodia with long handled hooks
 *Notomastus precocis*
3. Last 3 thoracic neuropodia with setae 4
4. Thoracic segments areolated *Notomastus magnus*
4. Thoracic segments smooth *Notomastus* spp.

Genus **LEIOCHRIDES** Augener, 1914*Leiochrides hemipodus*, new species

?*Leiochrides* sp. Hartman and Barnard, this volume, pp. 31, 44.

The type is selected from San Pedro Basin (Sta. 2798) ; many others are from San Pedro, Santa Catalina, San Nicolas, West Cortes, San Clemente, East Cortes, Long and Velero Basins and from Patton escarpment. The body is slender, cylindrical and moderately small. Total length may not exceed 30 mm, of which the thorax is 5.3 mm, and 28 abdominal segments measure 19 mm. None of the specimens is complete but the total number of segments may be about 50. Separation between thorax and abdomen is not marked except for a change in parapodia, where setae are abruptly replaced by uncini. The prostomium is a short, bluntly rounded lobe without eyes. The thoracic epithelium, like that of the abdomen, is smooth and glistening. The peristomium or first visible segment lacks parapodia and is somewhat longer than the next or first setigerous segment. This has notopodia, but lacks neuropodia. The next

is biramous and resembles those of the following one. All have pointed setae only, emerging in lateral series. In the first few segments the parapodial ridges are at the midlength of the segment; in the last several thoracic segments, the ridges are gradually farther back.

In larger individuals the first 5 thoracic segments are somewhat set off from the next by being somewhat inflated. The thoracic formula may be expressed as follows:

Prostomium followed by an achaetous peristomium; thoracic notopodia number 12 pairs with pointed setae only; thoracic neuropodia number 11 pairs, with pointed setae.

Long-handled hooded hooks are present in abdominal segments. Branchiae are present in abdominal segments, perhaps not before the middle region. At best development, they consist of 3 to 10-12 long, filiform, non-retractile lobes in palmate arrangement, and emerge from the notopodial lobe, posterior to the uncinial ridge. An occasional filament is bifurcated along its length.

Leiochrides is known for few species (see Hartman, 1947, p. 429) from shallow sea bottoms. *L. hemipodus* differs from others in that abdominal segments have palmately divided branchiae. It is known only from the basins of southern California and is presumed to be a deep water form.

Neoheteromastus, new genus

Genotype: **Neoheteromastus lineus**, new species

This genus is characterized by having a thorax consisting of 11 setigerous segments. The first segment or peristomium is a smooth ring. This is followed by 8 segments in which notopodia have pointed setae and 3 have uncini. The corresponding neuropodia include 6 with setae and 4 with uncini. Abdominal segments have biramous parapodia provided with long handled hooks.

Neoheteromastus differs from other capitellids having 11 thoracic setigerous segments (Hartman, 1947, p. 402) as follows: *Notomastus* Sars typically has only setae in the thorax and only hooks in the abdomen. *Mastobranchus* Eisig has only setae in the thorax but the first 2 abdominal notopodia have setae and hooks. *Heteromastus* Eisig has 4 to 6 thoracic segments with setae, and 7 to 5 segments with hooks. *Barantolla* Southern has 6 setigerous and 5 uncinigerous thoracic parapodia. In *Neoheteromastus* the thorax has notopodia of which 8 are setigerous and 3 uncinigerous; the corresponding neuropodia include 6 setigerous and 4 uncinigerous; abdominal segments have only hooded hooks.

***Neoheteromastus lineus*, new species**

nr. *Barantolla* sp. Hartman and Barnard, this volume, p. 45, in part.

The type is selected from San Nicolas Basin (Sta. 5931); other individuals come from San Nicolas and Santa Catalina Basins. This is a small, nearly smooth, unadorned capitellid. None is posteriorly complete but total length may not exceed 25 mm. The prostomium is a short, small, semicircular lobe without eyes. The peristomium is a smooth, weakly biannulate ring about one and a half times as long as the first parapodial segment. The everted proboscis is subglobular, externally covered with coarse papillae resembling recurved spinelike cusps directed orally.

The thorax has long, distally pointed setae in the first 8 notopodia and long handled hooks in the last 3 notopodia. A neuropodium is lacking from the first setigerous segment; this is followed by 6 neuropodia with pointed setae and 4 with long handled hooks. The hooks have a large fang, surmounted by a series of fine teeth and are distally covered with a rounded hood. Branchiae have not been observed and are presumed to be absent.

Neoheteromastus lineus has been recovered only from San Nicolas and Santa Catalina Basins in subsill depths; it may be considered a deep water species.

Genus *MEDIOMASTUS* Hartman, 1947, extended**Type *Mediomastus californiensis* Hartman, 1947**

The generic diagnosis is here extended to include species having 10 thoracic setigerous segments in which the first 4 to 6 have pointed setae, and the last 6 to 4 have long handled hooks. The thoracic formula thus reads: thorax with 4 to 6 setal segments in notopodia, 6 to 4 hooked segments in neuropodia. The abdomen has only long handled hooks; branchiae are believed absent.

***Mediomastus glabrus*, new species**

nr. *Barantolla* sp. Hartman and Barnard, this volume, pp. 45, 47-49, in part.

The type is selected from Santa Catalina Basin (Sta. 2850); other individuals come from Santa Catalina, San Nicolas and Tanner Basins. Largest specimens measure 10 to 15 mm long by 0.5 mm wide; none is posteriorly complete but posterior fragments are available. Separation

between thorax and abdomen is not sharp but is distinguishable by a difference in parapodial components. The prostomium is a small, semi-circular lobe without eyes. It is followed by a smooth peristomial ring. The first 6 setigerous segments have setae in both notopodia and neuropodia. They are followed by 4 segments having long handled hooks in both rami. The thoracic epithelium is smooth and glistening throughout.

Abdominal segments have long handled hooks; they differ also from those in the thorax in that the epithelium is thinner and flaccid. In far posterior segments the notopodia have a short, digitate lobe a little longer than wide, directed dorsolaterally; there is one pair to each segment; these lobes may be branchial but are not eversible.

Mediomastus glabrus differs from the only other known species of the genus, *M. californiensis* Hartman (1947, p. 407), in that the latter has setigerous segments 2 to 5 with pointed setae and 6 to 11 with long handled hooks. The latter is very common in shallow depths in fine sediments (unpublished data); *M. glabrus* is a deep water form.

Genus NOTOMASTUS Sars, 1851

Notomastus magnus Hartman, 1947

Hartman, 1947, pp. 412-415, pl. 50, figs. 1-6.

An immature or vegetative specimen from East Cortes Basin is questionably referred to this species. It is known more extensively from intertidal and shallow depths of California.

Notomastus precocis, new species

The type is selected from Santa Catalina Basin (Sta. 2848); other specimens come from San Pedro, Santa Catalina, Tanner and Long Basins. Length of a larger individual is 15.5 mm; width in the thorax or widest part is 1.2 mm; number of segments exceeds 50. The prostomium is a short, equally triangular lobe and lacks eyespots. The thoracic epithelium is smooth; its parapodial lobes are inconspicuous and occur at the midlength of the segments. The first segment or peristomium is a smooth, slightly biannulated, complete ring lacking parapodia. The next segment is complete with notopodia and neuropodia.

The everted proboscis is globular and proximally covered with coarse, triangular papillae. In the thorax, the notopodia have only pointed setae; neuropodia have setae in the first 8 segments and long handled hooks in the last 3 segments. Abdominal segments have only long handled hooded

hooks. These terminate distally in a large fang surmounted by 2 teeth, side by side, and are distally covered by a rounded hood.

A posterior fragment has simple, digitate branchial processes in notopodia; these lobes are a little longer than wide and perhaps not eversible.

Notomastus precocis differs from other species of the genus in having the last 3 thoracic neuropodia provided with hooks instead of setae. The thoracic epithelium is smooth, whereas in most other species of the genus it is more or less areolated. The species has been found only in subsill parts of deep basins off southern California.

Notomastus spp.

Fragments of capitellids characterized by having 11 thoracic setigerous segments, and only hooded hooks in the abdomen, have been recovered from San Pedro, Tanner, San Nicolas and Velero Basins. They may be referable to one of the several species named from California (Hartman, 1947, p. 411).

Capitellid, unknown genus and species

A small capitellid was recovered from San Nicolas Basin; it has only 8 thoracic setigerous segments, followed by abdominal segments with hooded hooks. It may represent an undescribed genus and species.

Family MALDANIDAE

Fifteen species are recognized and others are probably to be named. They may be identified by the following key:

Key to species

- | | |
|---|------------------------------|
| 1. Anterior end without a cephalic plaque (rimmed plate) | 2 |
| 1. Anterior end with a cephalic plaque | 6 |
| 2. Without cephalic or anal plaques | 4 |
| 2. Without cephalic but with anal plaque | 3 |
| 3. Anal plaque with entire margin | <i>Notoproctus pacificus</i> |
| 3. Anal plaque with 15 to 25 short cirri | <i>Nicomache lumbricalis</i> |
| 4. With thick acicular spines in first 7 neuropodial segments | <i>Praxillura maculata</i> |
| 4. With thick acicular spines in first 4 neuropodial segments | 5 |
| 4. With thick acicular spines in first 3 neuropodial segments; a collar present on fourth segment | <i>Clymenopsis cingulata</i> |

5. First few segments greatly prolonged (Plate 15, fig. 1) *Lumbriclymene lincus*
5. First few segments not greatly prolonged *Lumbriclymene* spp.
6. Anal pore dorsal to anal plaque 9
6. Anal pore within anal plaque 7
7. Cephalic plaque not sharply set off from body region and visible as a dorsal transverse ridge behind prostomial region *Rhodine bitorquata*
7. Cephalic plaque distinctly set off from body region 8
8. Anal plaque prolonged posteriorly as a cone 14
8. Anal plaque not prolonged posteriorly 13
9. Cephalic plaque with a longitudinal median nuchal ridge 10
9. Cephalic plaque without or with a very short nuchal ridge or smooth 12
10. Cephalic and anal plaques with entire margins 11
10. Ventral edge of anal plaque with crenulations *Maldane glebifex*
11. Anterior segments with melanistic pigment pattern *Maldane sarsi*
11. Anterior segments pale, without pigment pattern *Maldane sarsi*, pallid
12. Anal and cephalic plaques with crenulated margins *Asychis lacera*
12. Anal plaque otherwise *Asychis* spp.
13. Neuropodial spines of first 3 segments nearly straight; anal plaque with 18 filaments alternating long and short and a longest, midventral one *Euclymene delineata*
13. Neuropodial spines of first 3 segments distally crooked; anal plaque otherwise *Euclymene* spp.
14. Anal flange with 3 long cirri (Plate 15, fig. 3) *Praxillella trifla*
14. Anal flange with a circlet of many cirri 15
15. Anterior end of prostomium prolonged forward as a slender palpode *Praxillella gracilis*
15. Prostomium not prolonged forward as a palpode *Praxillella* sp.

Genus **NOTOPROCTUS** Arwidsson, 1907**Notoproctus pacificus** (Moore) 1906

Lumbriclymene pacifica Moore, 1906, pp. 246-248, pl. 12, figs. 40-42.

Notoproctus pacificus Moore, 1923, pp. 238-239.

Berkeley and Berkeley, 1952, pp. 56-57, figs. 117, 118.

First described from Chatham Strait, Alaska, in 282-293 fms, this species was recorded off Santa Catalina Island in abyssal depths (Moore, 1923, p. 239). Geographic and bathymetric ranges are extensive, with the known range limited to the northeast Pacific Ocean in shallow (65-71 fms) to abyssal (2196-2228 fms) depths.

Genus **NICOMACHE** Malmgren, 1865**Nicomache lumbricalis** (Fabricius) 1780

Nicomache carinata Moore, 1906, pp. 242-246, pl. 11, figs. 36-39; pl. 12, figs. 43-44.

Moore, 1923, p. 227.

This species occurs in southern California in basin depths (Moore, 1923, p. 227) and more widely from cosmopolitan areas. Tubes are attached to stones, externally covered with silt and internally somewhat horny. There are 2 preanal asetigerous segments. The pygidium is surrounded by 14 to 21 short, subequal cirri.

Genus **LUMBRICLYMENE** Sars, 1872**Lumbriclymene lineus**, new species

(Plate 15, figs. 1, 3)

The type specimen comes from Santa Catalina Basin (Sta. 5935) and others are from Tanner Basin. The body is very slender and attenuate; it measures about 30 mm long and less than 1 mm wide, and consists of 19 setigerous segments. Segmental nodes and the head region are dark reddish brown, whereas other parts are pale to nearly white. The first 4 segments have thick, single spines in neuropodia; they are yellow and slightly curved acicular. The anterior end is smoothly rounded above and has a pair of J-shaped nuchal slits in which the shorter anterior stem is directed outward and at an angle of about 110° to the long, posteriorly directed stem. Segments 1 to 3 resemble each other in that all have long internodes, and similar setal components (Plate 15, fig. 1).

The fourth segment differs in that it has 2 heavy, though similar, spines on either side and is also shorter than those in front. Its anterior margin is elevated and somewhat collarlike, and its notopodial setae are shorter than those in the first 3 segments. Thereafter the segments are noticeably shorter and neuropodia have transverse series of long handled uncini.

Short, darkly pigmented, glandular rings surround the body at the level of the setal ridges. The anal pore is located dorsoposteriorly, near the end of a slightly inflated segment (Plate 15, fig. 3) in which the epithelium is reticulated.

Neuropodial uncini occur in transverse series numbering 10 to 15 in a row. Each is a flat plate with a large fang surmounted by a series of smaller teeth in a single row.

The tube is arenaceous, fully attached to the hard substratum, and irregularly coiled and twisted.

Lumbriclymene lineus differs from other species of the genus in having greatly prolonged segments anteriorly. It has been recovered only from basin depths and is believed to be a deep water species.

Lumbriclymene sp.

Three anterior ends come from Tanner Basin, the longest measuring 8 mm long for 5 anterior segments. It lacks a cephalic plaque. Nuchal organs are nearly right angled, with the 2 limbs almost equally long. The peristomium lacks parapodia or setae. The first 4 segments increase in length posteriorly. Parapodia are biramous from the first segment; notopodia have slender, small setal fascicles and the first 4 neuropodia have large, yellow acicular spines, numbering only 1 to a parapodium. The fifth segment has neuropodia with few (2 to 4) transitional hooks, and segments farther back have rostrate hooks.

These specimens may represent an unnamed species, more abundantly present in the outer series of basins, or in deep water.

Genus *PRAXILLURA* Verrill, 1880

Praxillura maculata Moore, 1923

Moore, 1923, pp. 225-227, pl. 18, figs. 31, 32.

Three specimens come from Santa Catalina Basin. This species is previously known only through a single anterior fragment and tube taken off Santa Cruz Island, in 447-510 fms, in black mud and rocks (Moore, 1923, p. 227). The following description is based on specimens collected by the VELERO IV.

The surface throughout is mottled with dark brown spots in dispersed pattern, most concentrated on the head and first 12 segments. The anterior and posterior ends lack plaques. The body consists of 33 or more segments. The mouth is a very large oval opening on the ventral side of the peristomial segment. The first 10 segments are short, wider than long and set off from one another by deep segmental grooves. The first 7 and the last 5 setigerous segments have single, thick dark spines in neuropodia, and the last 3 acicular segments have no notopodial setae. This region is followed posteriorly by the constricted tapering anal ring with dorsal anal pore.

The first 7 setigerous segments have tufts of notopodial setae and 1 or 2 thick, dark, yellowish brown spines that are conspicuously striated internally and distally slightly curved. The next 3 or 4 segments are transitional, with the uncini increasing in number gradually. The uncinial rows are always short, with not more than 9 to 12 uncini in a row, in median segments. Uncini have 7 teeth in a single row, largest at the base and decreasing in size gradually distally.

The tube is long, cylindrical, measuring to 200 mm long, and closely fits the occupant. Its walls consist of thick silt over a translucent chitinized membrane; it is externally covered with flat fragments of shell bits and other debris and resembles an onuphid tube but is more friable.

Praxillura maculata remains known only from southern California, in deep water.

Genus **CLYMENOPSIS** Verrill, 1900

Clymenopsis cingulata (Ehlers) 1887

Clymene cingulata Ehlers, 1887, pp. 185-188, pl. 47, figs. 2-5.

This species was collected in Santa Catalina and Tanner Basins. Two tubes from Tanner Basin are long, cylindrical, measure 70 mm long by 1.8 mm wide; they are constricted at one end, and have a short, hyaline chimney, a characteristic of some other maldanid tubes. Several similar, though smaller, tubes come from Santa Catalina Basin. The body measures to 50 mm long by 1.4 mm wide and consists of 19 setigerous, and 9 posterior, preanal asetigerous segments; it lacks cephalic and anal plaques. The fourth segment has a conspicuous collar. Heavy acicular spines are present in 3 anterior segments; they are light yellow and straight, and about 5 times as thick as the accompanying notopodial setae. On the prostomium the nuchal organs are crescentic to somewhat

right-angled, with short limbs. The buccal segment is not clearly set off from the first setigerous segment.

Notopodial setae are present from the first setigerous segment and are of two kinds—longer, larger, stiff, smooth ones, and an equal number of smaller, shorter ones; they terminate in an arista or fimbriated tip. Bearded uncini are few in number, at most 6 in a single transverse row. They are first present in the fourth segment, where they number about 4 in a transverse row, and continue posteriorly through the last, or 19th, setigerous segment.

The fourth, or collar segment, varies from longer to shorter, but is usually nearly as long as the preceding segment. The collar is low on the dorsal side and increases midventrally to its longest point; it is deepest above. Its origin is in front of the uncinigerous ridge. In a specimen from Tanner Basin the collar is straight, not oblique.

Tubes are thick walled, of gray mud or somewhat arenaceous; they are straight and terminate in a narrow, translucent chimney and are externally lightly covered with small foraminifers.

Leiochone borealis, *sensu* Moore, 1923, p. 227, from off Point Loma light, in 549-585 fms, in green mud, may be the same species. Another species resembling it is *Lumbriclymene constricta* Wesenberg-Lund (1948, pp. 12-15, fig. 4) from Davis Strait, Greenland, in 1096-2258 meters. It also has a collar on the fourth segment, prolonged at its ventral end. There are thick, acicular spines in 3 (not 4 segments as in *Lumbriclymene*) segments and the posterior end has 5 preanal asetigerous segments. If it is the same as *Clymenopsis cingulata*, the geographic distribution is extensive, including the West Indies, Greenland and southern California, in deep water.

Genus **PRAXILLELLA** Verrill, 1881

Praxillella gracilis (Sars) 1861

Moore, 1923, p. 238.

Berkeley and Berkeley, 1952, p. 50, figs. 101, 102.

Small, immature or vegetative individuals come from Santa Catalina and West Cortes Basins. Larger, reproductive specimens are frequent from shelf and slope depths of southern California. The species is recorded from cosmopolitan areas, in 48 to 766 fms.

Praxillella trifila, new species

(Plate 15, figs. 2, 4)

Praxillella, unknown sp. Hartman and Barnard, this volume, p. 46.

The type is chosen from San Nicolas Basin (Sta. 6341); others are from Santa Catalina and San Nicolas Basins. All are fragmented, represented by slender pieces with large, nodular segmental nodes, and cylindrical, arenaceous tube fragments. Length of a longer posterior end, with 11 setigerous segments and an anal cone, is 28 mm and width 1 mm. Segments probably total 19 on complete specimens. The cephalic plaque is plain, with a small triangular prostomial lobe lacking eyes, separated from the lateral flanges by a pair of anterolateral incisions, and continued middorsally to a median incision. The nuchal organs are parallel, straight grooves extending through most of the length of the cephalic plaque.

The peristomium is about two and a half times as long as wide; it is separated from the first setigerous segment by a faint segmental line. The first 3 setigerous segments are long, cylindrical, their length about 5 times their width. Each has long, slender, distally pointed setae in notopodia, and single, acicular spines in neuropodia. The third neuropodium usually has 2 spines on a side. From the fourth segment the length/width ratio is 2/1 or less. These segments have neuropodia provided with rostrate hooks (Plate 15, fig. 4) in vertical series.

The body terminates in a long cone with terminal pore. In some the proctodaeum is everted as a subspherical sack (Plate 15, fig. 2); in others it is withdrawn. The cone is characterized by the presence of 3 very long, slender cirri, a pair in dorsolateral, and a midventral attachment. This cone is preceded by 3 long, barrel-shaped asetigerous segments, and a fourth in which rostrate hooks (Plate 15, fig. 4) are present in sparse numbers, and also one or a few very slender pointed setae. The fourth preanal segment is imperfectly setigerous.

Praxillella trifila is characterized by having 3 very long, slender cirri on the anal cone; segments lack a collar; the first 3 setigerous segments have acicular spines. It bears a resemblance to *Asychis triflora* Augener (1926, p. 187; Mesnil and Fauvel, 1939, fig. 12) from New Zealand and the Gulf of Oman in deep water, which also has 3 long anal cirri; the latter, however, has a collar on the fifth segment.

P. trifila has been recovered only in deeper parts of the middle and outer basins; it is believed to be a deep water form.

Praxillella sp.

Another species taken in San Nicolas Basin (Sta. 6341) with the preceding, and in Santa Catalina Basin, differs from *P. trifla* in that the cephalic plaque lacks a flange and a postmedian incision. The posterior 4 or more segments are bell-shaped, broadest at their posterior ends. There is a single preanal, asetigerous segment, preceded by a shorter though similar segment which has setae but no uncini. The pygidium is a tapering cone with a long midventral but no lateral cirri.

Genus **EUCLYMENE** Verrill, 1900**Euclymene delineata** Moore, 1923

Moore, 1923, pp. 231-233, pl. 18, figs. 39, 40.

Specimens come from 2 stations in San Pedro Basin. Length is 25 to 35 mm. There are no segmental collars. The first 3 setigerous segments have single thick, nearly acicular neuropodial spines; these are replaced by rostrate hooks farther back. The prostomial nuchal organs are straight, parallel grooves. The anal funnel is surrounded by 18 slender filaments alternating long and short, and a longest midventral one.

This is known only off Santa Rosa Island in 243-265 fms (type) and from San Pedro Basin. It may be a deep water form.

Another larger species of the same genus is *E. reticulata* Moore (1923, pp. 230-231, pl. 19, figs. 37, 38), also from considerable depths. It is distinguished from *E. delineata* by its greater size (length 52 mm); anterior neuropodial spines are distally crooked. Its geographic range overlaps that of *E. delineata*.

Genus **RHODINE** Malmgren, 1865**Rhodine bitorquata** Moore, 1923

Moore, 1923, pp. 223-225, pl. 18, fig. 30.

Berkeley and Berkeley, 1952, pp. 52-53, figs. 107, 108.

Fragments of collared segments are frequent in samples from most basins; they include San Pedro, Santa Cruz, San Nicolas, Tanner, West Cortes, San Clemente, East Cortes Basins, and the San Diego trough. This species attains its greatest development in shallower bottoms of southern California, in depths of 100 fms or less. The original account

was based on specimens from Monterey Bay in 75 to 766 fms. The species is more widely recorded from western Canada, in shallow to deep water (Berkeley and Berkeley, 1952, p. 53).

Genus **MALDANE** Grube, 1860

Maldane sarsi Malmgren, 1865

Moore, 1923, p. 237.

Characteristic pigmented individuals are abundant in shallow bottoms of southern California, in depths of 30 to 100 or more fms. Similar, though pale or unpigmented specimens occur in San Pedro and Tanner Basins. Like the shelf form, they occur in tubes of thick mud, closely adherent to the occupant. The species has a cosmopolitan distribution in shallow to eurybathic depths.

Maldane cristata Treadwell, 1923

Maldane carinata Moore, 1923, pp. 233-235.

Hartman, 1956, pp. 295-296.

This species was taken in San Pedro, Santa Catalina and San Clemente Basins. As *M. carinata* it came originally from San Clemente Island in 654-704 fms.

The cephalic plaque is elliptical in outline; its limbate margin is divided by a pair of deep, smooth incisions into a pair of lateral flaring lobes and a posterior lobe with smooth margin. A collar arises from the posterior border of the peristomium; it is high, stiff and erect; its margin is smooth except for a wide, shallow emargination middorsally. The cephalic plaque has a prominent, arched carina beginning at the prostomial palpode. The first 3 setigerous segments are strongly biannulate, with the anterior ring glandular all around and the posterior parapodial one about twice as long. Segment 6 has an anterior dorsal flange slightly overlapping segment 5. The pygidium is a near duplicate of the cephalic plaque except that it lacks a palpode and nuchal organs.

Maldane cristata is known from western Mexico and California in considerable depths.

Maldane ?glebifex Grube, 1860

Berkeley and Berkeley, 1952, p. 45, figs. 85, 86.

A single specimen from San Diego trough differs from other species of the genus taken in the basins in that the anal flange is denticulate.

It is presumed to be a representative of *M. glebifex*, known more widely from European seas and the northeast Pacific Ocean (Berkeley and Berkeley, 1952, p. 45).

Genus **ASYCHIS** Kinberg, 1867

Asychis lacera (Moore) 1923

Maldane lacera Moore, 1923, pp. 235-237.

Single, large individuals, with tubes measuring to 180 mm long, were taken in Santa Catalina and Santa Barbara Basins. The original collection was taken off Point Lima light, in 549-595 fms. The species is typically a deep water form.

Asychis spp.

Fragments, including cephalic and anal plaques, were taken in San Pedro, San Nicolas, West Cortes Basins and Patton escarpment. Most have a deep collar preceding the first setigerous segment. In one from West Cortes Basin, the cephalic plaque has U-shaped nuchal organs and the posterior flange is entire. Another, from San Nicolas Basin, has both plaques ornamented along the lateral margins. None agrees with *A. disparidentata* Moore (1923, p. 237) best known from shallower depths (unpublished records).

Family **OWENIIDAE**

Genus **MYRIOCHELE** Malmgren, 1867

Myriochele gracilis Hartman, 1955

Tubes with small individuals were taken in San Pedro, Santa Catalina and questionably San Nicolas Basins. This species occurs more widely in slope depths of southern California (unpublished records).

Myriochele pygidialis, new species

(Plate 16, figs. 1-4)

The type is selected from West Cortes Basin (Sta. 5944); others are from Santa Cruz, San Nicolas, San Clemente, East Cortes and Long Basins. The tube is long, tough, internally heavily chitinized and externally covered with silt and prickly particles; it measures 210 to 250 mm long by 1.17 mm wide and is cylindrical. The animal, dissected out of a tube, measures 57 mm long by 0.65 mm across and consists of about 43

setigerous segments (Plate 16, fig. 1). The anterior end is plain, collar-like except for a midventral cleft (Plate 16, fig. 2). The pygidium is petaloid, terminating in 7 to 9 short, thick lobes arranged in a circlet except for a middorsal groove (Plate 16, fig. 3); the anal pore is located centrally within the circlet.

Setal and uncinial ridges are pale; the rest of the body is brownish and closely mottled. The number of segments may vary from 34 to 43, with the last 12 to 14 shorter than the others. The first four segments are shorter than the fifth, which is longer than the first four together, and the sixth one is the longest. The seventh is again shorter and the posterior segments gradually decrease in length.

The first 3 setigerous segments have notopodial fascicles only; from the fourth, parapodia are biramous, with pointed setae in notopodia and long handled uncini in neuropodia. The setal ridges are near the posterior end of a segment. The last 10 to 15 segments are shorter than others and their setae are prolonged as slender tufts.

Uncini have a long cylindrical stem and terminate distally in 2 sharp teeth at right angles to the shaft; the distal or main tooth is larger than the subdistal one (Plate 16, fig. 4).

Within the body cavity, the presence of pale ova indicates the maturity of the specimens; a larger ovum measures 0.13 mm across.

Myriochele is known for about 8 species (Hartman, 1959, p. 469) a few of which come from deep water. *M. heeri* Malmgren has been recorded off the Antilles in 2975 fms (McIntosh, 1885, p. 410). *M. eurystoma* Caullery (1944, p. 52) was named from off Makassar in a range of depth from 32 to 1570 meters. *M. pacifica* McIntosh (1885, p. 413) was trawled in the middle Pacific Ocean in 2600 fms. This is not to be confused with *M. pacifica* Annenkova (1937, p. 183) from the northern part of the Japanese Sea in 45 meters. It differs from McIntosh's species in having a long, dorsal, non-retractile shield at its anterior end, and is here renamed *Myriochele annenkovae*, new name.

Myriochele pygidialis differs from each of these in having a posterior end terminating in a circlet of processes; the body is long and slender with as many as 43 segments; uncini have a different form.

M. pygidialis has been recovered only from the outer series of basins and may represent an abyssal species.

Myriowenia, new genusGenotype: **Myriowenia californiensis**, new species

Setigerous segments number 29 or more. The first 3 setigerous segments are uniramous and others are biramous. The posterior end is tapering and unadorned. Notopodial setae are simple, long, slender and distally pointed. Neuropodial setae are simple long shafted hooks terminating in a large fang at right angles to the shaft. *Myriowenia* differs from *Myriochele* (see above) in having a pair of long, thick palpi emerging from the dorsal side of the prostomium (Plate 16, fig. 5).

Myriowenia californiensis, new species

(Plate 16, figs. 5, 6)

Myriochele gracilis Hartman, 1955, pl. 2, fig. 5 only.

No specimens are complete. One comes from San Pedro Basin and most of the others are from shallower silty bottoms of southern California. The type is selected from 2.8 miles west of Santa Catalina Island in 58 fms (Sta. 2175), from a bottom of mud and shell. Many others come from shallower to deeper bottoms off southern California in similar sediments. There is no tube but in some instances a thin, mucoid covering is present. A larger fragment, perhaps more than half complete, measures 22 mm long and 1.3 mm wide; it consists of at least 29 setigerous segments. The anterior cephalic region is inflated or subspherical, has a pair of dorsally inserted long palpi, set off from the first segment by a shallow to deep constriction (Plate 16, fig. 5). These palpi are conspicuously speckled with light brown pigment on the upper or outer side, in fresh collections.

Uncini are present in neuropodia from the fourth segment and continue to the posterior end; they occur in short transverse series, at first ventrolaterally and from about segment 27 ventrally located, the paired series of a segment separated medially by a short space. The corresponding notopodia are located dorsolaterally. Seen separately, uncini are sharply curved hooks terminating distally in a single tooth (Plate 16, fig. 6).

Myriowenia californiensis has been recovered from numerous samples, chiefly in shelf and slope depths of southern California, and may be only occasional in basin depths of inner basins.

Family AMPHARETIDAE

At least twelve species in nine genera are represented. Species of this family are confused and in need of major revision. Those recorded from the basins of southern California may be identified according to the following key.

Key to species

1. With paleae (modified setae) projecting laterally from a peristomial region 2
1. Without paleae 4
2. Paleae weak, about as thick as thoracic notopodial setae and distally oblique; thorax consisting of 15 setigerous segments *Melinnampharete eoa*
2. Paleae stronger, much thicker than thoracic notopodial setae; thorax consisting of 14 to 17 setigerous segments 3
3. With 14 thoracic setigerous segments 6
3. With 15 thoracic setigerous segments *Anobothrus gracilis*
3. With 16 thoracic setigerous segments; lower lip crenulated *Lysippe annectens*
3. With 17 thoracic setigerous segments 7
4. Branchiae partly pinnately divided *Schistocomus hiltoni*
4. Branchiae cirriform or at least not pinnate 5
5. With a pair of large, postbranchial spines *Melinna heterodonta*
5. Without postbranchial spines 8
6. Larger; more than 20 mm long when mature; abdomen with 13 segments *Ampharete arctica*
6. Smaller; less than 8 mm long; with more than 14 abdominal segments ?*Ampharete* sp.
7. One of branchial pairs broadly expanded and foliaceous; paleae straight and tapering distally *Amphicteis scaphobranchiata*
7. Branchiae subulate; paleae with thicker, slightly curved stem and long, slender distal mucron *Amphicteis mucronata*
8. Lateral margins of segments 2 to 5 raised as in species of *Melinna* *Melinnexis moorei*
8. Lateral margins of segments not raised 9
9. Branchiae greatly prolonged, extending to end of body (Plate 17); with 12 thoracic setigerous segments *Amage longibranchiata*

9. Branchiae not so prolonged 10
 10. With 14 or 15 abdominal segments . . . *Amage anops*
 10. With 10 abdominal segments . . . *Amage scutata*

Genus **AMAGE** Malmgren, 1866

Amage scutata Moore, 1923

Moore, 1923, pp. 210-212, pl. 17, figs. 19-24.

This species was first described from collections off Point Pinos light in 40-46 fms, green mud, and in Santa Catalina Basin in 302-638 fms, green mud. It has been collected more recently in shallower bottoms (unpublished records) but not from basin depths. The species is known only from southern California from moderate to deep bottoms.

Amage longibranchiata, new species

(Plate 17)

Amage anops and var. Hartman and Barnard, this volume, pp. 36-61.

The type specimen was selected from Santa Monica Basin (Sta. 3020); others come from Santa Monica, San Pedro and Santa Cruz Basins. The species is characterized by its greatly prolonged 4 pairs of branchiae (Plate 17); they are of a single kind, have a thick base and taper distally; when laid back they reach nearly to the end of the body. They are inserted in tandem series, with those of successive pairs slightly approaching medially but widely separated from each other at the most proximal positions. The fourth branchia is inserted on the third, or first setigerous, papillar parapodium, and the other 3 pairs are progressively more forward on the dorsolateral sides of segments.

The prostomium is 3-lobed, flat, and without eyes or other color markings. Its median part is broadly quadrate and its lateral areas are auricular at the sides, behind the shorter quadrate area. The peristomium or first segment has similar ear-shaped fleshy lobes that are continued across the ventrum to form a large, thick, grooved lower lip. Within the oral cavity the numerous, smooth, slender oral tentacles can be seen, all of one kind and crowded.

The second segment, best seen on the ventral side of the body, is dorsally crowded between the peristomium and the following segment. It lacks parapodia, branchiae or other structures. The third segment is large, broad and laterally extended as a pair of fleshy lobes; it is the

first branchial segment. The fourth is the second branchial segment and its lateral edge is provided with a small papillar lobe, representing a parapodium but lacking setae. The fifth segment is similar but its parapodium is slightly larger, and by the sixth segment it is even larger and provided with a tuft of slender setae. The seventh segment is the first normal one; its notopodium is a large, conical lobe with a full tuft of long setae and its neuropodium has a transverse row of uncini. This pattern is continued posteriorly through 10 segments.

The abdomen is abruptly narrower and tapers to a slender pygidium surrounded by small papillae. The thorax thus consists of 12 setigerous and 11 uncinigerous segments, and is followed by the abdomen with 11 uncinigerous segments.

Abdominal notopodia are small papillar lobes widely spaced from the corresponding neuropodia. Thoracic uncini are avicular, have a large base and terminate in 5 teeth in a single row; the lowest tooth is the largest and the more distal ones are successively smaller. Abdominal uncini are similar but smaller; they too terminate in 5 teeth in a single row.

The tube is thick, mud or silt covered, and usually much longer than the occupant within. Larger tubes measure 100 to 140 mm long by 10 mm wide, and enclose an animal about 30 mm long.

Amage longibranchiata differs from other species of the genus as indicated in the key above. It has been taken only in subsill depths of the inner series of basins, and in sediments of fine green muds.

Amage anops (Johnson) (1901, p. 424), with which this was first identified (Hartman and Barnard, this volume, pp. 36-51), is another species; it has short branchiae and 14 thoracic setigerous segments. It is known to occur from western Washington to California (Berkeley and Berkeley, 1952, p. 72) and has been taken in shallower soft bottoms of southern California (unpublished data).

Amage sp.

Small, less than 10 mm long, cylindrical tubes, containing smaller specimens, come from San Pedro, Santa Cruz and Tanner Basins. The tubes are externally covered with mud and an outer layer of white, orbicular foraminifers. The specimens have not been specifically identified.

Genus **AMPHARETE** Malmgren, 1866**Ampharete arctica** Malmgren, 1866

Berkeley and Berkeley, 1952, pp. 65-66, figs. 133-135.

Specimens come from San Pedro Basin; many more and larger ones were taken in shelf and slope depths along shore (unpublished). The species constructs mud walled tubes, externally covered with algal and other detrital bits, untidy in appearance; it grossly resembles that of an onuphid, *Diopatra ornata* Moore. The species is regarded as cosmopolitan and eurybathic.

?Ampharete sp.

Small individuals measuring less than 15 mm long were taken in San Nicolas Basin. They were removed from silt covered, mucoid tubes. The largest, measuring about 0.8 mm wide, may be mature. The thorax is about half of the total length. The body consists of 14 thoracic and at least 14 abdominal setigerous segments. The prostomium is 3-lobed, has a pair of large black ocular areas at the sides. Paleae are well developed and number about 15 on a side; they form spreading fascicles. Each one is long, distally tapering, acicular, and terminates in a slender pointed tip. These individuals may represent an unknown species.

Genus **AMPHICTEIS** Grube, 1850**Amphicteis ?scaphobranchiata** Moore, 1906

Moore, 1906, pp. 255-257, pl. 12, figs. 54-61.

Berkeley and Berkeley, 1952, pp. 68-69, figs. 139-141.

Specimens come from San Pedro, San Nicolas and questionably Tanner Basins. They are smaller than representatives from shallower depths and some have reduced prostomial eyes, but in other respects they seem to agree. The tube is mucoid, externally covered with mud, sponge spicules and other inert materials; it appears untidy. The species is more widely known from the northeast Pacific Ocean, in shallow to deep bottoms.

Amphicteis mucronata Moore, 1923

Moore, 1923, pp. 203-206.

Berkeley and Berkeley, 1952, p. 69, fig. 142.

This species was taken in San Pedro and Santa Catalina Basins. It differs from *A. scaphobranchiata* (see above) in being much smaller and

having the characteristic paleae, with a distal mucron. The species is more widely known from the northeast Pacific Ocean in shallower ocean bottoms (Berkeley and Berkeley, 1952, p. 69).

Genus **ANOBOTHRUS** Levinsen, 1883

Anobothrus gracilis (Malmgren) 1866

Berkeley and Berkeley, 1952, p. 67, fig. 137.

Numerous collections were taken in San Pedro, Santa Catalina, Santa Cruz and questionably Tanner Basins. Most are smaller than those taken from shelf depths, measuring usually less than 10 mm long. An ovigerous one measures 8.5 mm long and 0.7 mm wide and consists of 15 thoracic, and 12 abdominal setigerous segments. Paleae are well developed and number 12 to 15 on a side. The 4 pairs of long, slender branchiae are inserted in a single transverse row. The prostomium has a pair of dark areas at the sides, and a pair of minute eyespots farther back. Narrow, ventral gland shields are present through thoracic segments to the third from last one. The tubes are thick, mud walled, and closely adhere to the occupant.

Anobothrus gracilis is cosmopolitan in occurrence, usually in moderate depths (Berkeley and Berkeley, 1952, p. 67).

Genus **LYSIPPE** Malmgren, 1866

Lysippe annectens Moore, 1923

Moore, 1923, pp. 201-202, pl. 17, figs. 11-13.

Individuals were taken in Santa Catalina, San Nicolas, Tanner and questionably Velero Basins. They are smaller than those first described. An ovigerous one from Santa Catalina Basin measures about 14 mm long; the body consists of 17 thoracic and 10 abdominal setigerous segments. The branchial fold is high and prominent and carries 4 pairs of cirriform branchiae. The lower lip is broad and deeply crenulated, with 14 or 15 lobes. Paleae are weakly developed, no larger than the setae of the first setigerous segment. Ventral gland plates are present through the tenth setigerous segment.

Lysippe annectens is known from shallow to basin depths in southern California.

Genus **MELINNA** Malmgren, 1867**Melinna heterodonta** Moore, 1923

Melinna cristata heterodonta Moore, 1923, pp. 212-213, pl. 17, fig. 25.

This species was originally described from off Monterey Bay south to San Diego in depths of 110 to 2228 fms. It is characterized by having 18 thoracic setigerous segments. The postbranchial membrane is denticulated with 14 to 16 unequally long lobes. The species may be limited to deeper water, whereas *M. denticulata* Moore (1908) is found more abundantly in shelf and slope depths. The latter has 17 thoracic setigerous segments and the postbranchial membrane terminates in fewer (7 to 8) lobes.

Another small individual from San Diego trough (Sta. 6090) measuring 8.6 mm long, has branchiae nearly as long as the thorax; they are inserted on a pair of long, broad bases. The thorax consists of 17 setigerous segments, as in *M. denticulata*, but the postbranchial membrane terminates in 10-15 short, triangular lobes, irregularly longer and shorter. The large postbranchial dorsal hooks are pale yellow.

Genus **Melinnampharete** Annenkova, 1937

This genus is characterized by having pinnately divided oral tentacles. Branchiae number 3 pairs, are cirriform, and inserted in a straight transverse line. Paleae are present but not conspicuous; they terminate distally in an oblique tip. Postbranchial dorsal hooks are absent. Thoracic notopodia number 15 pairs. A dorsal ridge is present between setigerous segments 3 and 4. Nephridia open in segments 4, 6 and 7. A single species is known.

Melinnampharete eoa Annenkova, 1937

Annenkova, 1937, pp. 186-187, 213, pl. 4, figs. 39, 40.

Small individuals measuring to 15 mm long, without the long branchiae, were taken in Santa Cruz and San Clemente Basins. The 3 pairs of branchiae are inserted in a straight line. Paleae are weakly developed. The dorsal transverse membrane is not conspicuously fimbriated. The paleae have oblique distal ends.

Melinnampharete eoa is previously known from the northwest Pacific Ocean, in 78 to 1600 meters (Uschakov, 1955, p. 364). The species may be considered a deep water and abyssal form.

Genus **MELINNEXIS** Annenkova, 1931

This genus is characterized as follows: Oral tentacles are of 2 kinds, including a thick, papillated, proboscislike unpaired one, and many short, slenderer ones. The tentacular membrane is entire; glandular bands are absent. Branchiae number 4 pairs and are subulate. The lateral margins of segments 2 to 5 are raised, as in *Melinna*, but dorsal, postbranchial hooks are absent. A dorsal transverse fold is feebly visible but lacks denticulations. Segments 2 to 5 are provided with deeply embedded, slender, distally pointed setae. Longer, slenderer, notopodial setae are present from the third segment and occur on 14 segments. Uncini are present from the second one and continue back throughout the body.

The thorax consists of 17 segments and the abdomen of many. The body terminates posteriorly in a pair of long, anal cirri. Nephridia occur on segments 4, 6, 7 and 8; the anterior ones have a much longer shank than posterior ones.

Melinnexis was erected with type *M. arctica* Annenkova (1931, p. 269) from Franz Joseph Land in the Arctic Ocean. It has remained known largely through the investigations of Soviet scientists. Uschakov (1955, pp. 363-364) has summarized the two best known forms, *M. arctica* and *M. annenkovae* Uschakov, and added a third, *M. somovi* (1957, p. 1672) also from the Arctic in abyssal depths. At least 2 others, from more southern latitudes, may be congeneric.

Melinnexis monocera (as *Melinna monocera* Augener, 1906, p. 117) from the Lesser Antilles, has been referred to this genus by Annenkova (1931, p. 270). Another is *Melinnexis tentaculata* (Treadwell) from deep water off the Hawaiian Islands (Hartman, 1956, p. 296).

Moyanus Chamberlin (1919, p. 451) with type *M. explorans* Chamberlin (1919b, pp. 452-455, pl. 77, figs. 11, 12) from off Peru in 2222 fms, is almost certainly another species of the same genus. It is large, measures 114 mm long and 4 mm wide, and consists of 81 segments. The proboscislike organ is flattened dorsoventrally, and other tentacles are much slenderer and shorter. The dorsal membrane is on the fourth segment and not denticulate. Nuchal spines are absent. Branchiae number 4 pairs, are inserted on a common base, and all are of one kind. The thorax consists of 15 setigerous segments, but notopodia of the first few segments are very obscure.

Another species is *Sosanopsis armipotens* Moore (1923, pp. 215-216, pl. 18, figs. 26-29) from off Santa Catalina Island in 2228 fms, red mud. This is much smaller, measures only 31 mm long by 1.3 mm wide. The thorax has 16 setigerous, and the abdomen more numerous, segments. The unpaired oral tentacle is very large, and the lateral ones are much slenderer and shorter. Branchiae number 4 pairs, are filiform and arranged as in species of *Melinna* (see above); 3 are posterior and one pair is anterior. Nuchal spines are absent. Setal fascicles of the first 3 segments are in short, vertical, curved series; their stems are deeply buried, their blades short, delicate, tapered to acute tips. More posterior fascicles have longer and shorter setae. Thoracic uncini have 2 rows of 3-4 teeth each. Abdominal uncini have broad crowns and teeth are in more numerous rows of many each.

One more species may be mentioned; this was recorded as *Melinna pacifica* Moore (1923, p. 213); it is here referred to a new name (below).

Melinnexis moorei, new name

Melinna pacifica Moore, 1923, pp. 213-214. *Not* McIntosh, 1885, p. 440.

Two individuals from Patton escarpment (Sta. 5937) are believed the same as those named *Melinna pacifica* by Moore (1923). Nuchal spines are lacking. The 4 pairs of branchiae are cirriform and taper distally; those on each side form a close cluster, having a common stalk. The nuchal membrane is weakly crenulated.

Three larger ones, in long tubes, come from San Pedro Basin (Sta. 2895); the longest measures 250 mm long and contains a specimen 80 mm long. The species may have a distribution in deep and abyssal depths of southern California.

Genus *SCHISTOCOMUS* Chamberlin, 1919

Schistocomus hiltoni Chamberlin, 1919

Chamberlin, 1919a, p. 17.

A single collection is from San Pedro Basin; other larger, more mature specimens have been taken in shallower bottoms of southern California. Another, nearly related one is *Schistocomus sovjeticus* Annenkova (1937, p. 187) named from the northern part of the Japan Sea.

Family TERESELLIDAE

Genus **ARTACAMA** Malmgren, 1866**Artacama coniferi** Moore, 1905

Berkeley and Berkeley, 1952, pp. 74-75, figs. 150-151.

A large anterior end, measuring 5 mm across, comes from Tanner Basin. It consists of the large, coarsely papillated proboscoidal organ and several anterior setigerous segments. The species has a known range of distribution from western Canada south to western Mexico (Berkeley and Berkeley, 1952, p. 75).

Genus **NEOAMPHITRITE** Hesse, 1917**Neoamphitrite robusta** (Johnson) 1901

Berkeley and Berkeley, 1952, p. 85, fig. 174.

Amphitrite robusta Hartman and Barnard, this volume, p. 55.

Basin records include Santa Catalina and Santa Cruz. The species is more abundantly present in shallower, rocky bottoms of the northeast Pacific Ocean (Berkeley and Berkeley, 1952).

Genus **PISTA** Malmgren, 1866**Pista disjuncta** Moore, 1923

Moore, 1923, pp. 194-196, pl. 17, fig. 9.

Numerous individuals come from San Pedro, Santa Monica, Santa Catalina and Santa Cruz Basins. However, the species is much more abundantly present in slope depths, especially on muddy bottoms, where it occupies thickly coated, long muddy tubes. It is not known outside California.

Pista fasciata (Grube) 1870

Berkeley and Berkeley, 1952, p. 79, fig. 160.

Large tubes, measuring to 100 mm long, were taken in San Pedro Basin. Individuals removed from them measure about 68 mm long by 5.5 mm wide. The 2 pairs of branchiae are large and loosely dendritically branched. Conspicuous lateral lappets are present on the first, third and fourth (=first setigerous) segments. The species has a cosmopolitan distribution (Berkeley and Berkeley, 1952, p. 79).

Genus **STREBLOSOMA** Sars, 1872**Streblosoma crassibranchia** Treadwell, 1914

Several anterior ends were taken in San Pedro Basin; they may be juvenile or vegetative stages of this species, which is common in shallower depths (unpublished data).

Genus **THELEPUS** Leuckart, 1849**Thelepus setosus** (Quatrefages) 1865

Berkeley and Berkeley, 1952, p. 83, figs. 168, 169.

This species was taken in San Pedro Basin; it is more abundantly present in shallower bottoms. Its geographic distribution is cosmopolitan (Berkeley and Berkeley, 1952, p. 83).

Genus **LEAENA** Malmgren, 1866**Leaena caeca**, new species

Leaena, unknown sp. Hartman and Barnard, this volume, p. 63.

The type is selected from Santa Catalina Basin (Sta. 2850) in 620 fms. Other specimens are from the same area but in shallower, above-sill depths. An ovigerous adult measures 18.5 mm long and 1.2 mm wide; it consists of 16 thoracic and 13 abdominal segments; a posterior end is lacking. These abdominal segments measure about a third of the total length of the body. The body narrows abruptly between the thorax and abdomen, at the transition region. There are no eyes and no branchiae. The tentacular base is continued across the dorsum and provided with 9 to 12 pairs of cirriform tentacles inserted on a semicircular base. The lower lip is almost continuous in a transverse line with this base.

The first 2 visible segments are complete rings. Each is a little longer than the following segments and each has a short, lateral expansion but no true lappets. The third segment is the first setigerous, and the fourth is the first uncingerous. The thorax thus consists of 16 setigerous and 15 uncingerous segments.

Ventral scutes are present on all thoracic segments but the last seven. Those on the first 2 segments are largest, and later ones decrease in width gradually to the last one, which is longer than wide. Thoracic neuropodia have uncini in double rows. Those of the last 6 segments differ from the more anterior ones in being located ventrolaterally and

having thicker, elevated bases. Those of the first 10 segments are lateral, below the notosetal tuft.

All setae are distally smooth, broadly limbate and of a single kind, except that some are shorter, others longer. Uncini are short, avicular, have a large fang surmounted by a rostrate beak with many small teeth forming a broad head.

Leaena caeca differs from other species of the group (see Hessle, 1917, pp. 196-199) in that lateral lappets are weakly developed and present on only 2 segments. *Leaena videns* Chamberlin (1919, p. 18), from southern California in littoral zones, is another species; it has transverse bands of eyespots behind the tentacular base.

Leaena gracilis Moore (1923, pp. 191-192, pl. 17, fig. 8) from off Point Pinos lighthouse, in 204-239 fms, in gray mud, has 15 thoracic setigerous segments and is probably referable to *Lanassa* Malmgren.

Family TRICHOBRANCHIDAE

Genus *Terebellides* Sars, 1835

Terebellides stroemi Sars, 1835

Hessle, 1917, pp. 137-138.

Berkeley and Berkeley, 1952, pp. 75-76, figs. 152, 153.

Numerous individuals were collected from nearly all basins. Representatives are typically smaller than their shallower water relatives, and the pectinated branches of the branchia tend to be less compact than in the littoral form. They are here regarded as the cosmopolitan species, known from all major oceans (Berkeley and Berkeley, 1952, p. 76).

Family SABELLIDAE

Genus *POTAMETHUS* Chamberlin, 1919

Potamethus mucronatus (Moore) 1923

Notaulax mucronata Moore, 1923, pp. 243-245, pl. 18, figs. 43, 44.

Berkeley and Berkeley, 1951, pp. 333-334.

Numerous individuals come from San Pedro, Santa Monica and Santa Catalina Basins. Tubes are silt-covered, some adorned with long sponge spicules set on end, causing a spiny appearance, others nearly smooth. In some instances the tubes are clustered and loosely attached to one another by basal strands. Larger specimens measure 57 mm long

by 5.5 mm wide; others, much smaller, are only 20 mm long by 1.6 mm wide. The tentacular crown on smaller ones is longer than the thorax, whereas in larger ones the comparative lengths are reversed.

Thoracic notosetae are of 2 kinds; a longer superior limbate kind is superior, and more numerous, broad, mucronated ones of variable length are inferior. The accompanying neurosetae are long handled hooks.

Potamethus mucronatus was first described from abyssal depths off Santa Catalina Island, and off Santa Cruz Island in about 500 fms. It has since been recorded from the northeast Pacific Ocean (Berkeley and Berkeley, 1951, p. 333). It may be regarded as a deep water or abyssal form.

Genus **MYXICOLA** Koch in Renier, 1847

Myxicola infundibulum (Renier) 1804

Berkeley and Berkeley, 1952, p. 119, fig. 244.

This was taken only once, in San Pedro Basin, but has been frequently taken in shallower bottoms of southern California. The species is regarded as cosmopolitan and eurybathic.

Genus **CHONE** Kröyer, 1856

Chone spp.

Small immature or vegetative individuals were taken in San Pedro and Santa Catalina Basins. They may be representatives of one of the shallower water forms.

Family SERPULIDAE

Members of this family are poorly represented in grab samples from southern California. The best known are two species, one abundantly represented by tubes in the long shore basins, and the other associated with the dead remains of a lamp-shell brachiopod.

Genus **PROTIS** Ehlers, 1887

Protis pacifica Moore, 1923

Hartman, 1955b, pp. 51-52, pl. 4.

Tube fragments of this species are consistently present in samples from San Pedro and Santa Monica Basins and occasionally in basins

more distant. The white cylindrical tubes are apt to be attached to the translucent shell of a pelecypod, *Cyclopecten zephyrus* Grau. The known distribution is limited to southern California.

Genus **VERMILIOPSIS** Saint-Joseph, 1894

Vermiliopsis biformis, new species

(Plate 18, figs. 1-3, plate 19)

Numerous individuals have been taken, including some in Santa Catalina Basin (Sta. 2130), attached to the dead shells of *Lacqueus* (brachiopod) (Plate 18). The tube is characteristic in that the basal part is longitudinally ridged, with a high, dorsal keel, and the distal part is abruptly cylindrical, erect (Plate 18, fig. 1), resembling that of a *Serpula*. The animal within is a typical *Vermiliopsis* in that the operculum is inflated in its distal end (Plate 18, fig. 2); the stalk is smooth (Plate 18, fig. 3) or somewhat annulated. The species is more completely dealt with in another paper in preparation.

General Considerations and Conclusions

The deep water polychaetes of southern California cannot be studied without consideration of the reports based on the collections of the U.S.S. ALBATROSS from the eastern Pacific Ocean in 1904, largely published by Moore (1909, 1911, 1923). It is rewarding to find that the species named in these reports have been nearly all re-discovered through the operations of the VELERO IV. Some strictly abyssal forms (preceded by "A" in the list below) may occur only occasionally in the outer series of basins (see another report in this volume), whereas most of the other species may be eurybathic, some occurring over a wide range of depths and usually more closely associated with kinds of sediments (ranging from muds to rocks) than with depths of bottom.

Moore (1909 to 1923) recorded a total of 177 species based on the ALBATROSS collections, of which many were new at the time. Eighty-nine came from deep water (usually more than 300 fms) of which 10 may be regarded as abyssal, chiefly from depths greater than 1000 fms. Many of the others have been found at shallower depths and in other areas.

These deep water and abyssal species are as follows:

Family APHRODITIDAE

Aphrodita parva Moore, 1905, first reported from the Gulf of Georgia, western Canada, in 110-170 fms, later from California in 642-667 fms.

Aphrodita japonica Marenzeller, 1879, first recorded from Japan, later from southern California in depths to 640 fms.

Lactmonice pellucida Moore, 1903, first recorded from Bering Sea, later off southern California in depths to 671 fms.

A Lactmonice producta wyvillei McIntosh, 1885, first recorded from the Australian Antarctic in 50 to 1950 fms, and later off California in depths to 2195 fms.

Family POLYNOIDAE

Antinoella anoculata (Moore) 1910, first recorded off Monterey Bay and the Coronado Islands, in 618 to 766 fms.

Eunoë barbata Moore, 1910, originally from shallow water, but also in Monterey Bay in depths to 1062 fms.

Evarnella forcipata (Marenzeller) 1902, first recorded from southern Japan, later off California in depths to 580 fms.

Evarnella fragilis (Moore) 1910, in depths of 95 to 600 fms.

A Intoshella caeca (Moore) 1910, from abyssal depths to 1062 fms.

Harmothoe tenebricosa Moore, 1910, in depths of 500 to 800 fms.

Lepidonotus caelorus Moore, 1903, first recorded from Japan, later in shallow to 1400 fm depths, California.

Macellicephala aciculata (Moore) 1910, in 549-585 fms.

Macellicephala remigata (Moore) 1910, in 334-600 fms.

A Admetella renotubulata (Moore) 1910, in 2196-2228 fms.

Polynoë ?filamentosa Moore, 1910, in 334-600 fms.

Family NEREIDAE

Nereis procera Ehlers, 1868, first recorded off Washington, and California in shallow depths to 891 fms.

Ceratonereis paucidentata (Moore) 1903, first recorded from Bering Sea in shallow bottoms, and southern California to 2228 fms.

Family ONUPHIDAE

A Hyalinoccia tubicola stricta Moore, 1911, in 1059 fms.

Onuphis vexillaria Moore, 1911, in 243 to 468 fms.

Nothria iridescens (Johnson) 1901, first recorded from Washington, and California in depths to 800 fms.

Nothria pallida Moore, 1911, in 302 to 585 fms.

A Nothria hiatidentata Moore, 1911, in 1059 fms.

Family EUNICIDAE

Eunice multipectinata Moore, 1911, in 32 to 357 fms.

Eunice ?hawaiiensis Treadwell, 1906, in 1062 fms.

Family LUMBRINERIDAE

Lumbrineris index Moore, 1911, in shallow depths to 704 fms.

A Lumbrineris moorei Hartman, 1942, in 1350-2182 fms.

Lumbrineris bifilaris Ehlers, 1901, first recorded from Chile, later off southern California, in shallow bottoms to 2182 fms.

A Ninoë fusca Moore, 1911, in 2196-2228 fms.

Family GLYCERIDAE

Glycera capitata branchiopoda Moore, 1911, in 183 to 1400 fms.

Glycera tessellata Grube, known from cosmopolitan areas, and off southern California to 648 fms.

Family GONIADIDAE

Goniada annulata Moore, 1905, first recorded from Alaska, south to southern California in 1400 fms.

Goniada brunnea Treadwell, 1906, first recorded from Hawaii, later off southern California, in 618-667 fms.

Glycinde armigera Moore, 1911, in shallow depths to 541 fms.

Family ORBINIIDAE

Phylo nudus Moore, 1911, in 168 to 497 fms.

Family SPIONIDAE

Spiophanes fimbriata Moore, 1923, in 38 to 633 fms.

Laonice foliata (Moore) 1923, in shallow depths to 764 to 891 fms.

Laonice sacculata (Moore) 1923, in 49 to 580 fms.

Family CIRRATULIDAE

Caulleriella gracilis (Moore) 1923, in depths of 197 to 2228 fms.

Tharyx sp. (as *T. multifilis* Moore, 1909) in depths of 285-323 fms.

Family OPHELIIDAE

Ammotrypane aulogaster Rathke, cosmopolitan, and off southern California in shallow depths to 1059 fms.

Family STERNASPIDAE

Sternaspis fossor Stimpson, 1854, first recorded from eastern Canada, and off California in eurybathic depths.

Family FLABELLIGERIDAE

Pherusa papillata Johnson, 1901, first recorded from Washington, south to Lower California in 1400 fms.

Brada pluribranchiata Moore, 1923, in 197-281 and to 766 fms.

?*Pherusa collarifera* Ehlers, 1887, first recorded off Florida, later off Point Loma to 488 fms.

Family MALDANIDAE

Asychis lacera (Moore) 1923, in 549-585 fms.

Maldane cristata Treadwell, 1923, first recorded off Lower California in 475 fms, and southern California in 38-704 fms.

Maldane sarsi Malmgren, 1865, first recorded from western Europe, and off southern California in 39 to 800 fms.

Euclymene reticulata Moore, 1923, in 43-44 fms to 617-680 fms.

Heteroclymene glabra Moore, 1923, in 243-280 fms.

Isocirrus longiceps (Moore) 1923, in 56-59 fms, and to 447-510 fms.

Nicomache carinata Moore, 1906, first recorded off Alaska, and southern California in 143 to 1400 fms.

Rhodine bitorquata Moore, 1923, in 75 to 766 fms.

Notoproctus pacificus Moore, 1906, first recorded from Chatham Strait in 282-293 fms, and southern California in 2196-2228 fms.

Praxillella gracilis (Sars) 1861, first recorded off Norway, and southern California in 49 to 766 fms.

Praxillura maculata Moore, 1923, in 447-510 fms.

Family AMPHARETIDAE

- Amage arieticornuta* Moore, 1923, in 264-271 and 1083 fms; also north to western Canada (Berkeley and Berkeley, 1942).
- Amage scutata* Moore, 1923, in 40-46 and 302-638 fms.
- Ampharete arctica* Malmgren, 1866, first recorded from northern Europe, and California in 285 to 1041 fms.
- Ampharete grubei* Malmgren, 1866, first recorded from northern Europe, and California to 766 fms.
- Amphicteis mucronata* Moore, 1923, in 40 to 667 fms.
- Amphicteis scaphobranchiata* Moore, 1906, first recorded off western Canada, and southern California in depths to 110 fms.
- Anobothrus gracilis* Malmgren, 1866, first recorded from northern Europe, and southern California to 456 fms.
- Lysippe annectens* Moore, 1923, in 38-55 to depths of 1059 fms.
- Melinna denticulata* Moore, 1908, first recorded off Alaska, and southern California in depths to 585 fms.
- Melinna heterodonta* Moore, 1923, in 849 to 1400 fms.
- A Melinnexis* sp. (as *Melinna pacifica* Moore, 1923) off southern California in 264-271 and 1350-2182 fms.
- A Melinnexis tentaculata* (Treadwell) 1906, first recorded off Hawaii and off southern California in 2228 fms.

Family TERESELLIDAE

- Amphitrite cirrata* Müller, 1771, first recorded from Iceland, and off southern California in 447-510 fms.
- Amphitrite robusta* Johnson, 1901, first recorded off Washington, and southern California to 766 fms.
- Pista disjuncta* Moore, 1923, in 18 to 640 fms.

Family TRICHOBRANCHIDAE

- Terebellides stroemi* Sars, 1835, first recorded from northern Europe, and southern California in shallow to 633 fms.
- Terebellides ehlersii* McIntosh, 1885, first recorded off Fiji Islands, and southern California in 51 to 667 fms.
- Terebellides stroemi japonica* Moore, 1903, first recorded off Japan, and southern California to 298 fms.

Family SABELLIDAE

Potamilla neglecta Sars, 1851, first recorded off northern Europe, and southern California in 243 to 287 fms.

A Potamethus mucronatus (Moore) 1923, in 2196-2228 fms, also in 447 fms.

Euchone magna Moore, 1923, in 75 to 271 fms.

Family SERPULIDAE

Protis pacifica Moore, 1923, in 243 to 265 fms.

Among this list, species not yet recovered by operations of the VELERO IV are some abyssal forms, especially scale-worms, and others inhabiting rocky bottoms; they are not satisfactorily sampled by the grabbing device used on the VELERO IV. Most of the species named in the list have a range of distribution limited to California, or extend northward to western Canada or Japan, and south to western Mexico; a few are cosmopolitan.

Bathymetrically considered, most of the species in the basins are found also on the slopes (to 350 fms) or on the shelf. However, those normally attaining their maximum abundance or development on the shelf, are usually subnormal at basin depth. Those typically occurring in basin depths seldom range to shelf depths.

Deep water and/or abyssal polychaetes of world-wide areas have been named and summarized by others. McIntosh (1885) named 83 from collections of the CHALLENGER expedition. Two species were named from 3125 fms; 22 from 2000 to 3000 fms; 45 from 1000 to 2000 fms, and 14 species from depths of 600 to 1000 fms. The relative numbers of species from different depth classes are not significant, since there was no attempt at a method of grid sampling. However, it is significant that none of the species were represented in more than one depth class. The best represented families or superfamilies were the ampharetids, maldanids, terebellids, Eunicia and scale-worms.

Eliason (1951) summarized 150 species from depths of more than 3000 meters (about 1500 fms). The families best represented were again the ampharetids, scale-worms, terebellids, maldanids and serpulids.

Kirkegaard (1954) recognized 213 abyssal species, of which only 11 are regarded as cosmopolitan; but about half of these are eurybathal, leaving only 5 abyssal cosmopolitan species. These are *Laetmonice filicornis* Kinberg, *L. producta willemoesi* McIntosh (all scale-worms) and

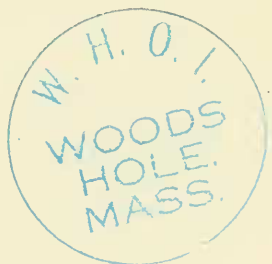
Maldanella harai (Izuki) (a maldanid). None of these has been identified from the basins of southern California. Kirkegaard concluded that about a third of the total number occur in shallow parts (to 2000 meters) of the abyss, 111 species at depths below 2000 meters, and only 32 species are ultra-abyssal. Later (1956, p. 70) he named polychaetes from depths of 6000 meters depth or more. Of these 10 were regarded as abyssal, occurring in temperatures below 4° C. Two, *Macellicephalo abyssicola* Fauvel, a polynoid, and *Kesun abyssorum* Monro, an opheliid, occur in all three major oceans. Two others are in the Atlantic and Pacific oceans, one is in the Pacific and Indian oceans, and two are from the deep Pacific ocean. Five out of 15 species are eurybathic and eurythermal.

In this connection it should be noted that the specific identity of at least two species may be doubted. *Tharyx multifilis* Moore, first named from shallow water of southern California, is recorded from the Banda trench in 6580 meters. *Ancistrosyllis constricta* Southern, named from the east coast of India in shallow waters of high temperatures, is recorded from the same trench and depth. It seems likely that these specific entities have been given too broad an interpretation, and that a comparison with materials from type localities will disclose specific differences.

The only typical abyssal genera recovered from the basins of southern California are *Laetmonice*, *Hyalinoecia* and *Ilyphagus*. Species which may be regarded as strictly deep water, and extending into abyssal depths are: *Leanira calcis* and *L. alba*, *Euphosine paucibranchiata*, *Lumbrineris moorei* and *L. longensis*, *Ceratocephala loveni pacifica*, *Nereis anoculis*, *Eunereis caeca*, *Onuphis vexillaria*, *Ninoe fusca*, *Phylo nudus*, *Calisia calida*, some paraonids, opheliids, maldanids, ampharetids, and terebellids.

A general feature concerning the polychaetes is the telescoping or reduction of characters from those usually present in representatives of shallower water. Many of the species nearly, but not quite agree, with those from shelf depths. Typical examples are *Glycera capitata branchiopoda* Moore which differs from *G. capitata* Oersted chiefly in that the branchial portion of parapodial lobes is noticeably longer than in shallow water forms. *Goniada brunnea* has a transition region from thorax to abdomen farther forward than in shelf specimens. *Tharyx tessellata* is usually pale white and very fragile from basin depths, whereas specimens from shallow water tend to be dark to deep purple and inhabit tough, chitinized tubes. *Scalibregma inflatum* has prolonged parapodial bases in deep water specimens, while those from shallow bottoms have

short parapodia. *Maldane sarsi* has a characteristic melanistic pigment pattern when coming from shallow bottoms; deep water representatives are pale. *Prionospio pinnata*, in shallow bottoms, has prostomial eyes and greater overall size, whereas in deep bottoms it nearly lacks eyes and specimens are smaller. *Terebellides stroemi* from basin depths is smaller and has branchiae less compact than from shallow depths. Other examples might be cited.



LITERATURE CITED

ANNENKOVA, N. P.

1931. Zur Polychaetenfauna von Franz-Joseph-Land (*Melinnexis* gen. nov. *arctica* sp. n.). Zool. Anz. Leipzig, vol. 95, pp. 269-272, 4 figs.
1934. Paraoniden der Meeren des fernen Ostens der U.S.S.R. C. R. Acad. Sci. U.R.S.S., pp. 656-661, figs. 1-3.
1937. Fauna Polychaeta severnoi chasti Iaponskogo Moria. The polychaete fauna of the northern part of the Japan Sea. Issledovaniia morei SSSR, fasc. 23, pp. 139-216, 60 figs.
1938. Polikhety severnoi chasti Iaponskogo Moria i ikh fatsial'noe i vertikal'noe raspredelenie.—Polychaeta of the North Japan Sea and their horizontal and vertical distribution. Gidrobiol. eksped. 1934 g. Iaponskoe More. Trudy, v. 1, pp. 81-230.

AUGENER, H.

1924. Polychaeta von Neuseeland. I. Errantia. Vidensk. Medd. naturh. Foren. København, vol. 75, pp. 241-441, 11 figs.
1926. Polychaeten von Neuseeland. Sedentaria. Foren. Vidensk. Medd. naturh. København, vol. 81, pp. 157-294, figs. 1-22.

BARNARD, J. L. AND O. HARTMAN

1959. The sea bottom off Santa Barbara, California: Biomass and community structure. Pacific Naturalist, vol. 1, no. 6, pp. 1-16, figs. 1-7, tables 1-7.

BERKELEY, E. AND C. BERKELEY

1938. Notes on Polychaeta from the coast of western Canada. Ann. Mag. Nat. Hist., ser. 11, vol. 1, pp. 33-49, figs. 1-12.
1941. On a Collection of Polychaeta from Southern California. Bull. So. Calif. Acad. Sci., vol. 40, pp. 15-60, figs. 1-18.
1950. Notes on Polychaeta from the coast of western Canada. IV. Polychaeta sedentaria. Ann. Mag. Nat. Hist., ser. 12, vol. 3, pp. 50-69, figs. 1-8.
1951. A second record of the polychaetous annelid *Potamethus elongatus* (Treadwell). Jour. Wash. Acad. Sci., vol. 41, pp. 333-334, figs. 1-4.
- 1948-1952. Polychaeta errantia and Polychaeta sedentaria. Canadian Pacific Fauna, vol. 9b (1) and (2), pp. 1-100, 1-139, figs. 160 and 292.
1956. Notes on Polychaeta from the East Coast of Vancouver Island and from adjacent waters, with a description of a new species of *Aricidea*. Jour. Fish. Res. Bd. Canada, vol. 13, pp. 541-546, figs. 1-6.

CAULLERY, M.

1944. Polychètes sédentaires de l'Expedition du SIBOGA. Siboga-Exped. Leiden, vol. 24.2 bis, pp. 1-204, figs. 1-157.

CHAMBERLIN, R. V.

- 1919a. New polychaetous annelids from Laguna Beach, California. Jour. Entom. Zool. Claremont Coll., vol. 11, pp. 1-23.
- 1919b. The Annelida Polychaeta. Mem. Mus. Comp. Zool. Harvard, vol. 48, pp. 1-514, pls. 1-80.

EHLERS, E.

1868. Die Borstenwürmer. Leipzig, Wilhelm Engelmann. pp. 269-748, pls. 12-24.
1887. Report on the annelids of the dredging expedition of the U.S. coast survey steamer BLAKE. Mem. Mus. Comp. Zool. Harvard, vol. 15, pp. 1-335, pls. 1-60.
1901. Die Polychaeten des magellanischen und chilenischen Strandes. Festschrift zur Feier des 150 jährigen Bestehens der K. Gesells. Wiss. Göttingen. pp. 1-232, pls. 1-25.

ELIASON, A.

1951. Polychaeta. Reports of the Swedish Deep-Sea Expedition. Vol. II, Zoology. No. 11, pp. 131-148, pl. 1.

FAUVEL, P.

1913. Quatrième note préliminaire sur les Polychètes provenant des campagnes de l'*Hirondelle* et de la *Princesse-Alice*, ou déposées dans le Musée océanographique de Monaco. Bull. Inst. océanogr. Monaco, no. 270, pp. 1-80, figs. 1-13.
1914. Annélides polychètes non-pelagiques provenant des campagnes de l'*Hirondelle* et de la *Princesse-Alice* (1885-1910). Rés. Camp. sci. Monaco, fasc. 46, pp. 1-432, 31 pls.
- 1923-1927. Polychètes errantes, and Polychètes sédentaires. Faune de France, vols. 5 and 16, pp. 1-488, and 1-494, 188 and 152 figs.
1932. Annelida polychaeta of the Indian Museum, Calcutta. Mem. Indian Mus. Calcutta, vol. 12, pp. 1-262, 9 pls., 40 textfigs.
1953. Annelida Polychaeta. The Fauna of India. Allahabad, pp. 1-507, figs. 1-250.

FISHER, W. K.

1949. Additions to the Echiuroid fauna of the North Pacific Ocean. Proc. U.S. Nat. Mus., vol. 99, pp. 479-497, pls. 28-34.

HARTMAN, O.

1936. New species of polychaetous annelids of the family Nereidae from California. Proc. U.S. Nat. Mus., vol. 83, pp. 467-480, figs. 1-8.
1938. Descriptions of new species and new generic records of polychaetous annelids from California of the families Glyceridae, Eunicidae, Stauronereidae and Opheliidae. Univ. Calif. Publ. Zool., vol. 43, pp. 93-112, figs. 1-63.
1940. Polychaetous annelids. Chrysopetalidae to Goniadidae. Allan Hancock Pacific Exped., vol. 7, pp. 173-287, pls. 31-44.
1941. Some contributions to the biology and life history of Spionidae from California. Allan Hancock Pacific Exped., vol. 7, pp. 289-324, pls. 45-48.
1942. The identity of some marine annelid worms in the United States National Museum. Proc. U.S. Nat. Mus., vol. 92, pp. 101-140, figs. 1-15.
1944. Polychaetous annelids. Eunicea . . . Sabellariidae. Allan Hancock Pacific Exped., vol. 10, pp. 1-310, pls. 1-26.
1945. The marine annelids of North Carolina. Duke Univ. Marine Sta. Bull. no. 2, pp. 1-54, pls. 1-10, 2 charts.
1947. Capitellidae, Pilargiidae. Allan Hancock Pacific Exped., vol. 10, pp. 391-523, pls. 43-63.

1950. Polychaetous annelids. Goniadidae, Glyceridae, Nephtyidae. Allan Hancock Pacific Exped., vol. 15, pp. 1-181, pls. 1-19, 3 figs.
1952. *Iphitime* and *Ceratocephala* (Polychaetous annelids) from California. Bull. So. Calif. Acad. Sci., vol. 51, pp. 9-20, pls. 3, 4.
- 1955a. Quantitative survey of the benthos of San Pedro basin, southern California. Part I. Allan Hancock Pacific Exped., vol. 19, pp. 1-185, charts 1, 2, plates 1-7.
- 1955b. Endemism in the North Pacific Ocean, with emphasis on the distribution of marine annelids, and descriptions of new or little known species. Essays in the Natural Sciences in honor of Captain Allan Hancock, Los Angeles, California, pp. 39-60, pls. 1-4.
1956. Polychaetous annelids erected by Treadwell, 1891 to 1948, together with a brief chronology. Bull. Amer. Mus. Nat. Hist., vol. 109, pp. 239-310, pl. 21.
1957. Orbiniidae, Apistobranchidae, Paraonidae and Longosomidae. Allan Hancock Pacific Exped., vol. 15, pp. 211-393, 1 chart, pls. 20-44.
1959. Catalogue of the Polychaetous Annelids of the World. In 2 parts. Allan Hancock Found. Publ. Occas. Pap. no. 23, pp. 1-628.
- HESSLE, C.
1917. Zur Kenntnis der terebellomorphen Polychaeten. Zool. Bidr. Uppsala, vol. 5, pp. 39-258, pls. 1-5, figs. 1-66.
- HORST, R.
1923. On three remarkable Annelida Polychaeta. Zool. Meded. Leyden, vol. 7, pp. 221-224, 2 figs.
- JOHNSON, H. P.
1901. The Polychaeta of the Puget Sound region. Proc. Boston Soc. Nat. Hist., vol. 29, pp. 381-437, pls. 1-19.
- KIRKEGAARD, J. B.
1954. The Zoogeography of the abyssal Polychaetes. IUBS, Naples, Ser. B, no. 16, pp. 40-43.
1956. Benthic Polychaeta from depths exceeding 6000 meters. Galathea Report, vol. 2, pp. 63-78, figs. 1-13.
- KRAMP, P. L.
1959. *Stephanoscyphus* (Scyphozoa). Galathea Report, vol. 1, pp. 173-188, text-figs. 1-12, pl. 1, figs. 1-13.
- McINTOSH, W. C.
1885. Report on the Annelida Polychaeta collected by H.M.S. CHALLENGER during the years 1873-76. Challenger Reports, vol. 12, pp. 1-554, pls. 1-55, 1a-39a.
- MALMGREN, A. J.
1867. Annulata Polychaeta Spetsbergiae, Grönlandiae, Islandiae et Scandinaviae hactenus cognita. Forhandl. Öfv. K. Svenska Vetensk. Akad., vol. 24, pp. 127-235.
- MARENZELLER, E.
1879. Südjapanische Anneliden. Denkschr. Akad. Wiss. Wien, vol. 41, pp. 109-152, pls. 1-6.

MESNIL, F. and P. FAUVEL

1939. Polychètes sédentaires de l'expédition des SIBOGA. Maldanidae, Cirratulidae, Capitellidae, Sabellidae et Serpulidae. Siboga-Exped., vol. 24.2, pp. 1-42, figs. 1-12.

MONRO, C.

1933. The Polychaeta Errantia and Sedentaria collected by Dr. C. Crossland at Colón in the Panama region and the Galapagos Islands during the expedition of the S.Y. *St. George*. Proc. Zool. Soc. London, pp. 1-96, 1039-1092, figs. 1-36, 1-31.
1937. The John Murray Expedition 1933-34. Scientific Reports. Polychaeta, vol. 4, no. 8, pp. 243-321, 28 figs.
1939. Polychaeta. Antarctic Research Expedition, 1929-1931. Adelaide, Australia. Reports, Ser. B. vol. 4, pt. 4, pp. 89-156, 28 figs.

MOORE, J. P.

1902. Descriptions of some new Polynoidae with a list of other Polychaeta from North Greenland waters. Proc. Acad. Nat. Sci. Phila., vol. 54, pp. 258-278, pls. 13, 14.
1903. Polychaeta from the coastal slope of Japan and from Kamchatka and Bering Sea. Proc. Acad. Nat. Sci. Phila., vol. 55, pp. 401-490, pls. 23-27.
1906. Additional new species of Polychaeta from the north Pacific. Proc. Phila. Acad. Sci., vol. 58, pp. 217-260, pls. 10-12.
- 1909-1923. The polychaetous annelids dredged by the U.S.S. Albatross off the coast of southern California in 1904. Proc. Phila. Acad. Sci., vol. 61, pp. 321-351, pls. 15, 16; vol. 62, pp. 328-402, pls. 28-33; vol. 63, pp. 234-318, pls. 15-21; vol. 75, pp. 179-259, pls. 17, 18.

NUTTING, C. C.

1909. Alcyonaria of the Californian coast. Proc. U.S. Nat. Mus., vol. 35, pp. 681-727, pls. 84-91.

OKUDA, S.

1939. Annelida Polychaeta in Onagawa Bay and its vicinity. Sci. Rep. Tohoku Univ., ser. 4, Biol., vol. 14, pp. 219-244, pls. 1-14.

TREADWELL, A. L.

1906. Polychaetous annelids of the Hawaiian Islands, collected by the steamer ALBATROSS in 1902. Bull. U.S. Fish Com., Wash., vol. 23, pp. 1145-1181, 81 figs.
1922. Polychaetous annelids collected at Friday Harbor, State of Washington, in February and March, 1920. Pub. Carnegie Inst. Wash., no. 312, pp. 171-181, 37 figs.
1941. Polychaetous annelids from the New England region, Porto Rico and Brazil. Amer. Mus. Novitat. N.Y., no. 1138, pp. 1-4, figs. 1-12.

USCHAKOV, P. V.

1953. Novye vidy mnogoshchetinkovykh chervei iz semeistva Phyllodocidae (Polychaeta). Trudy Inst. Okeanol., Akad. nauk SSSR, vol. 12, pp. 311-321, figs. 1-5.
1955. Mnogoshchetinkovye chervi dal'nevostochnykh Morei SSSR (Polychaeta). Opredeliteli po faune SSSR, Akad. nauk SSSR, no. 56, pp. 1-445, figs. 1-164.

1957. K faune mnogoshchetinkovykh chervei (Polychaeta) Arktiki i Antarktiki, Zool. Zhur., Moscow, vol. 36, pp. 1659-1672, figs. 1-7.
- 1958a. Novye i interesnye vidy mnogoshchetinkovykh chervei (Polychaeta) iz raiona iuzhnogo Sakhalina i iuzhnykh Kuril'skykh Ostrovov. Issled. dal'nevost. morei SSSR, Akad. nauk SSSR, vol. 5, pp. 78-89, figs. 1-6.
- 1958b. [On the discovery of the polychaete (*Paralacydonia paradoxa* Fauvel, family PHYLLODOCIDAE) in the Yellow Sea.] [In Chinese]. Acta Zool. Sinica, vol. 10, no. 4, pp. 416-419, pl. 1.

WESENBERG-LUND, E.

1950. Polychaeta. In The Danish Ingolf-Expedition, Vol. 4, no. 14, pp. 1-92, pls. 1-10, figs. 12, 67 charts.

ZENKEVITCH, L. A.

1957. Novyi rod i dva novykh vida glubokovodnykh ekhiurid dal'nevostochnykh morei i severo-zapadnoi chasti tikhogo okeana. Trudy Instituta Okeanologii, vol. 23, pp. 291-295, figs. 1-6.

PLATES

PLATE 1

1. *Stephanoscyphus simplex* Kirkpatrick. (San Clemente Basin) Entire tube with pedal disk, distal end partly broken away, x 35.
2. *Distichoptilum verrillii* Studer. (San Clemente Basin)
A specimen, in 3 pieces, showing the basal bulb, the thickened region of the stem, and part of the shaft with polyps, x 8.

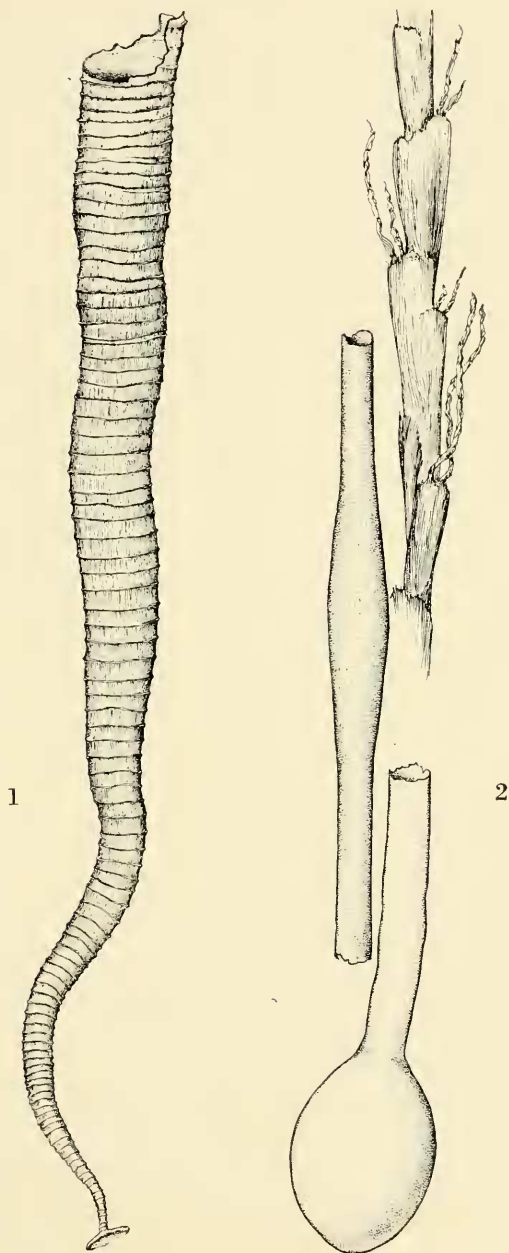


PLATE 2

Prometor poculum, new species (sta. 6051)

1. Entire animals, in left lateral view, x 1.
2. Nephridia, nephridiopore and projecting setae, in ventral view, x 7.
3. Posterior end, showing anal pore and circlet of gland cells, anal glands and posterior end of alimentary tract, x 7.
4. Seta, projecting from setal pore, showing an undamaged spatulate seta, x 55.

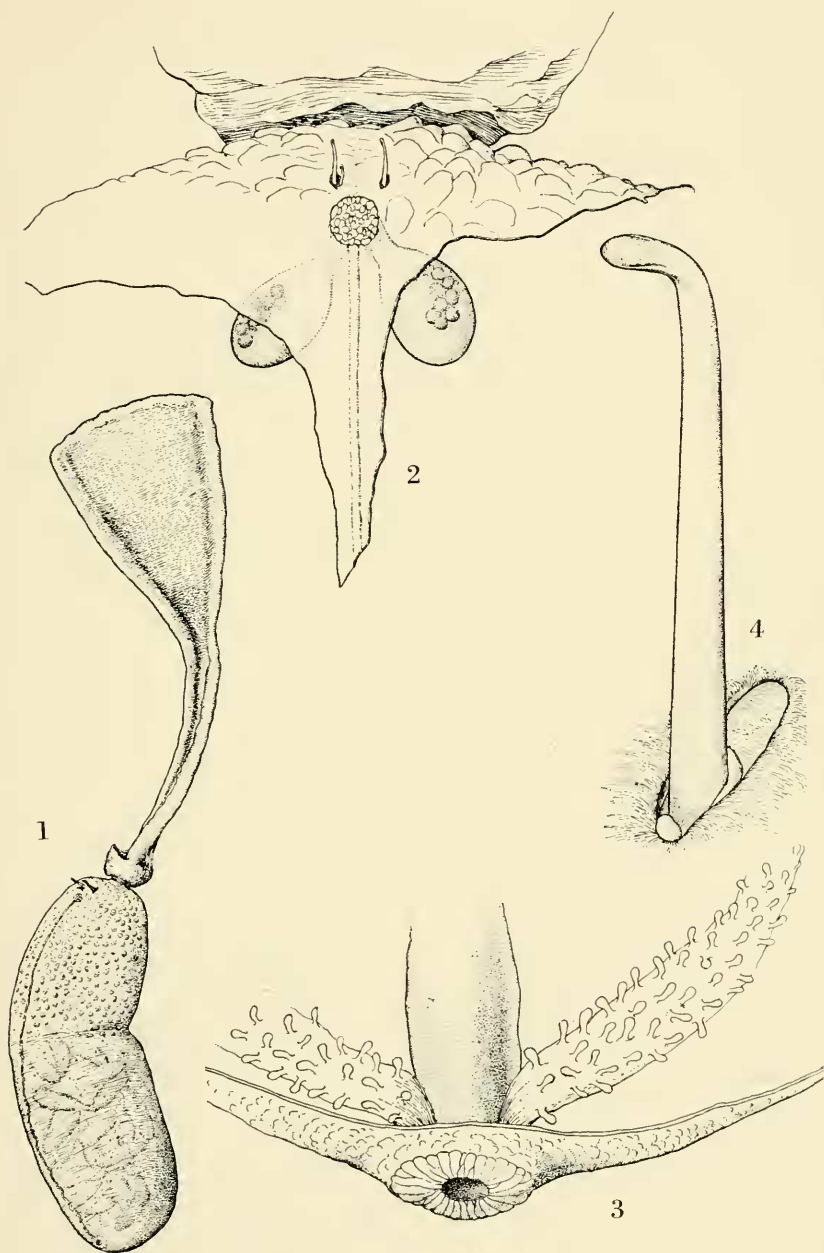


PLATE 3

Lagisca pedroensis, new species (sta. 2500)

1. Elytron from middle region of body, from right side, in dorsal view, showing position of elytral scar and surface ornamentation, x 32.
2. Outer margin of elytrum, x 400.
3. Bifurcated neuropodial seta, x 112.
4. Distal end of neuropodial seta, showing rugosity in crotch, x 460.
5. Notopodial seta, x 112.

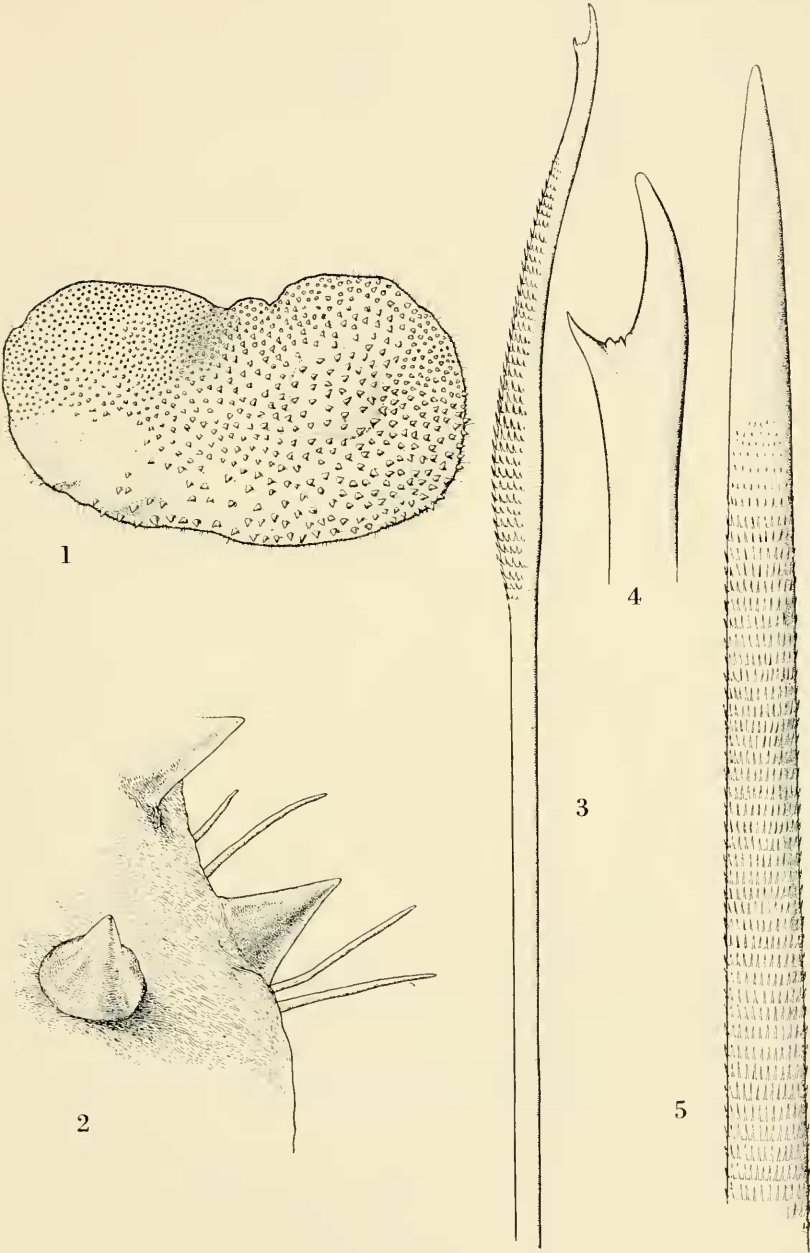


PLATE 4

Leanira calcis, new species (sta. 6340)

1. A median parapodium, in anterior view, x 38.
2. A composite, subacicular spinigerous seta, in three-fourths view, x 418.
3. A similar seta, in side view, x 418.
4. Another similar seta, seen on edge, x 418.
5. A composite, supra-acicular seta from a median parapodium, in side view, x 418.

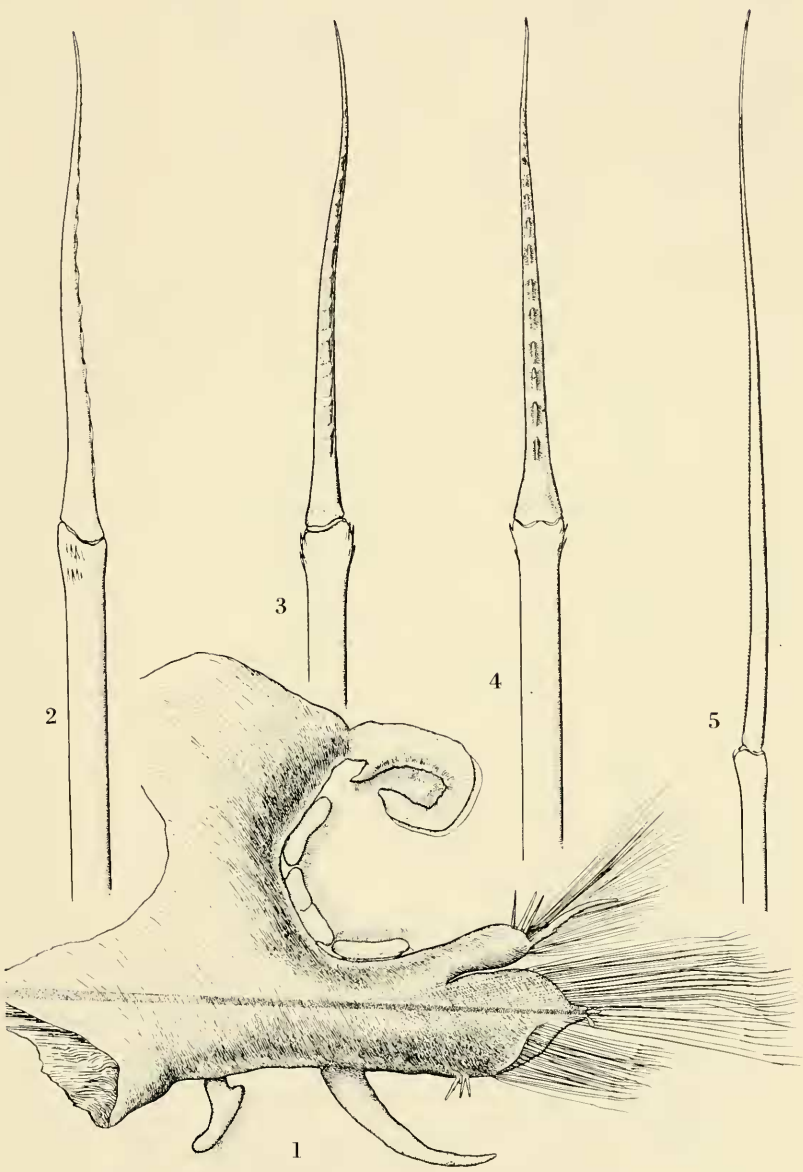


PLATE 5

Euphrosine paucibranchiata, new species (sta. 3028)

1. Tip of a notopodial seta from an anteromedian parapodium, x 910.
2. Tip of a neuropodial seta from the same parapodium, x 910.

?*Eteone* sp. (sta. 5937)

3. A median parapodium, in anterior view, x 140.
4. A composite spinigerous seta, showing structure and ornamentation at articulation, x 560.

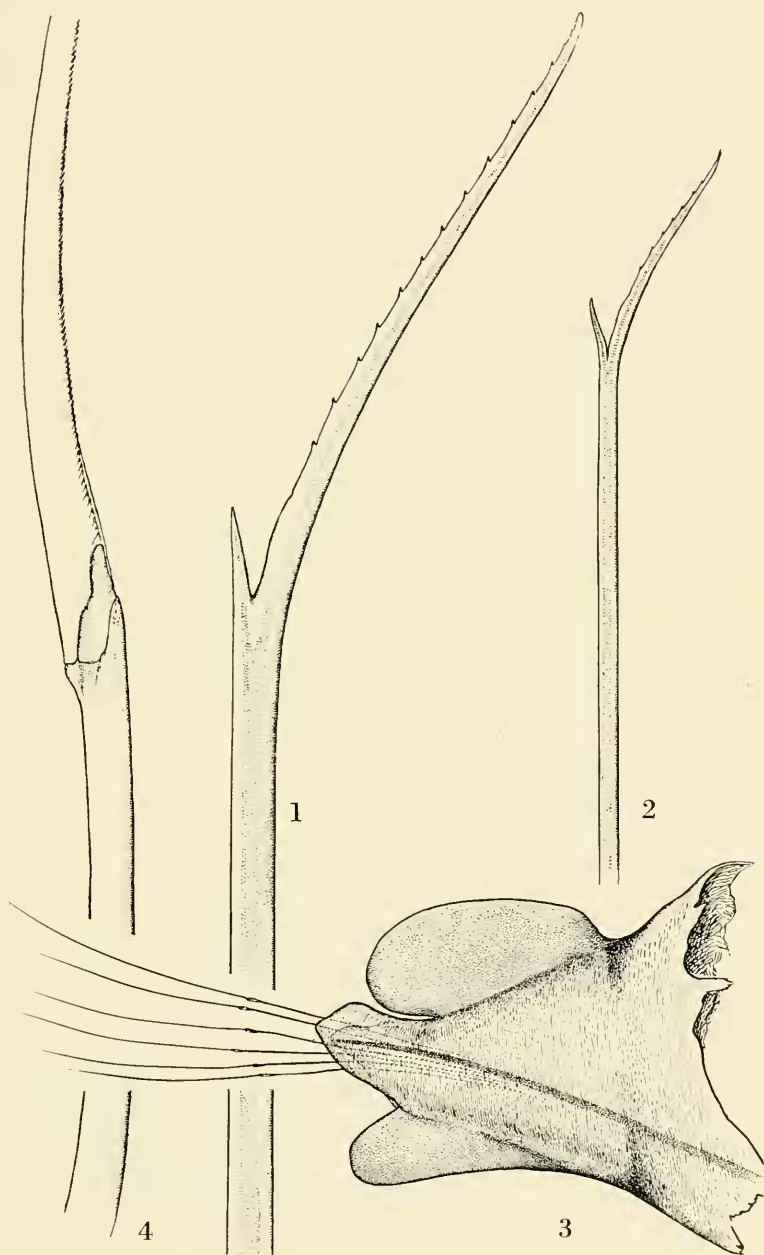


PLATE 6

Paralacydonia paradoxa Fauvel (sta. 5947)

1. Anterior end, showing prostomium and first 16 setigerous segments, in dorsal view, x 57.
2. Tenth parapodium, showing arrangement of parapodial lobes, in anterior view, x 210.
3. Articulation of a composite neuropodial seta, showing details of distal end of shaft with sheath, and denticulate teeth of appendage, x 2500.

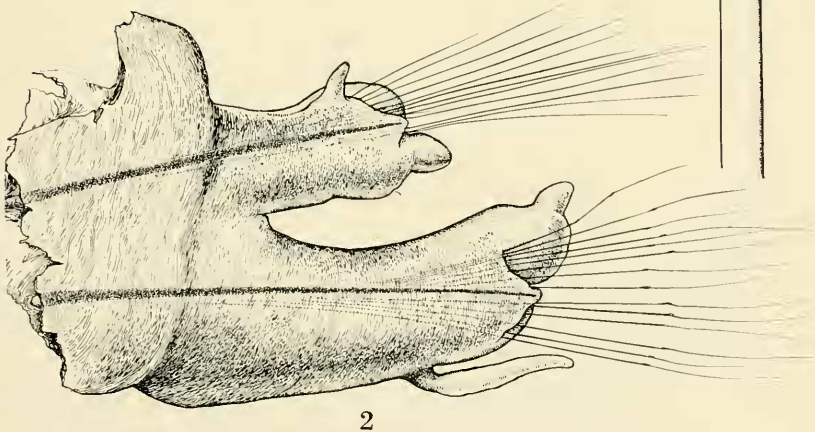
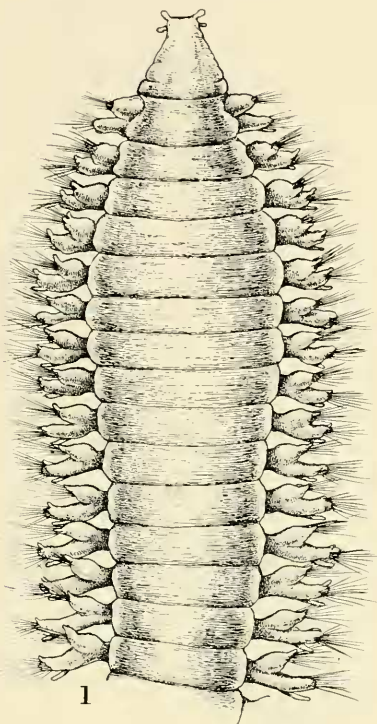


PLATE 7

Nereis anoculis, new species (sta. 6345)

1. Parapodium from a posterior region, showing relations of parapodial lobes, setae and acicula, x 38.
2. Distal end of a heterogomph falcigerous hook from a posterior neuropodium, x 120.
3. Distal end of a homogomph falcigerous hook from a posterior notopodium, x 120.

Pilargis hamatus, new species (sta. 2311)

4. A parapodium from a postmedian region, showing relations of notopodial and neuropodial parts, x 125.
5. A large notopodial spine from a posterior parapodium, x 440.
6. An inferior, distally bifid neuropodial seta from a posterior parapodium, x 2010.

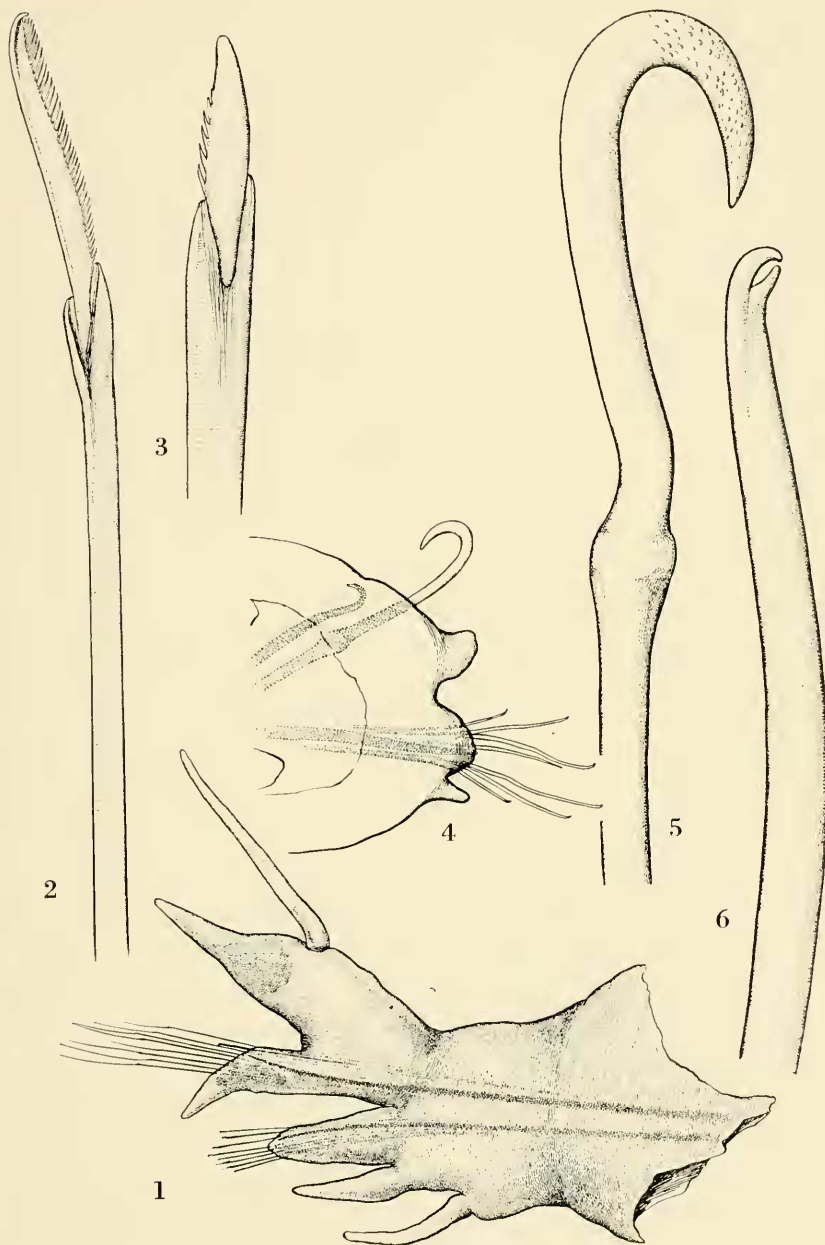


PLATE 8

Ceratocephala loveni pacifica (sta. 5939)

1. Tenth parapodium, in anterior view, x 210.
2. Proboscoidal jaw piece, dissected out, showing teeth along cutting edge, x 175.

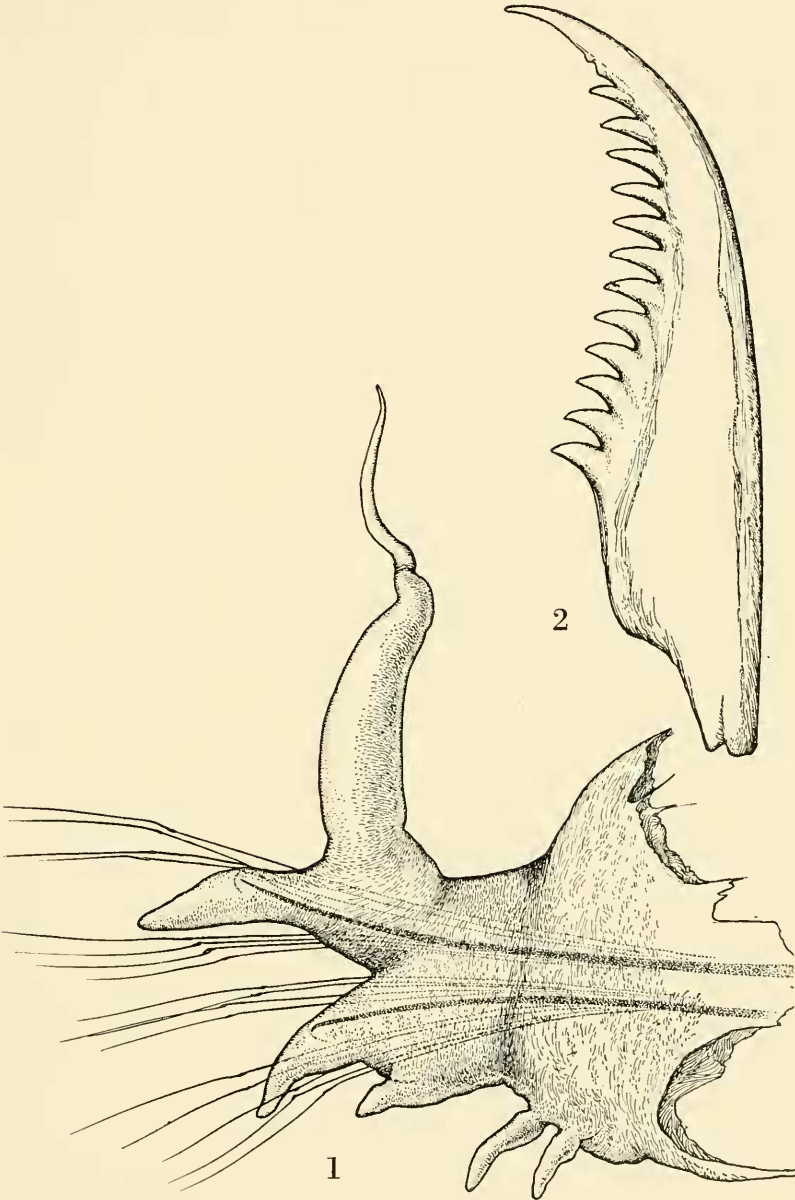


PLATE 9

Prionospio pinnata Ehlers (sta. 2193)

1. Anterior end, in left lateral view, showing head and first 16 setigerous segments, with attached palpi and 3 pairs of bipinnately divided branchiae, x 16.
2. Ninth neuropodium, in anterior view, showing arrangement of uncini, capillary and genital setae, x 135.
3. A hooded hook, seen from the side, x 1450.
4. A hooded hook, in frontal view, x 1450.
5. Base of genital spines and a hooded hook, seen protruding from neuropodial lobe, x 1445.

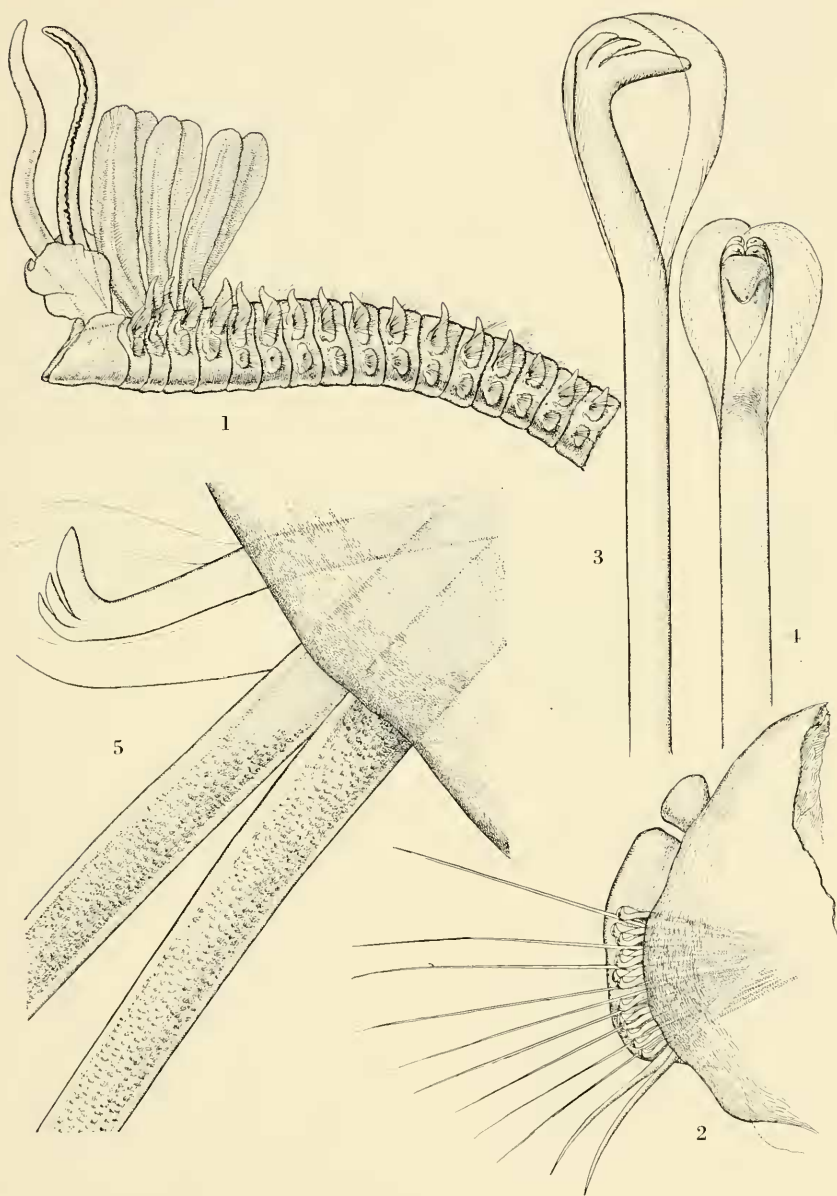


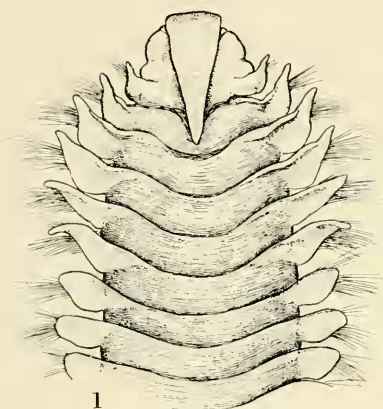
PLATE 10

Spiophanes pallidus, new species (sta. 5943)

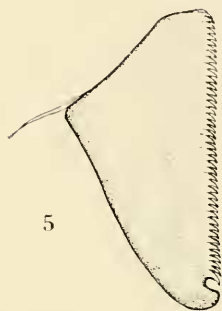
1. Anterior end of body, showing prostomium, foliaceous notopodial lobes, in dorsal view (palpi missing), x 44.
2. A hooded hook from a posterior neuropodium, x 1730.

Phyllochactopterus limicolus, new species (sta. 2794)

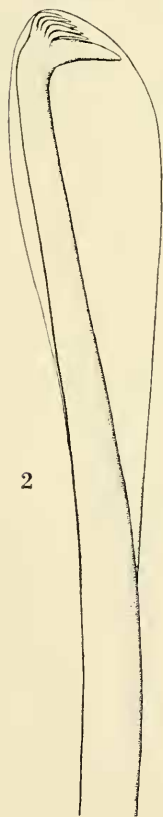
3. Anterior end, showing first, second and part of third body regions, in three-fourths view, x 19.
4. A large modified spine from fourth setigerous segment, x 197.
5. Uncinial plate from tenth setigerous segment, x 1987.



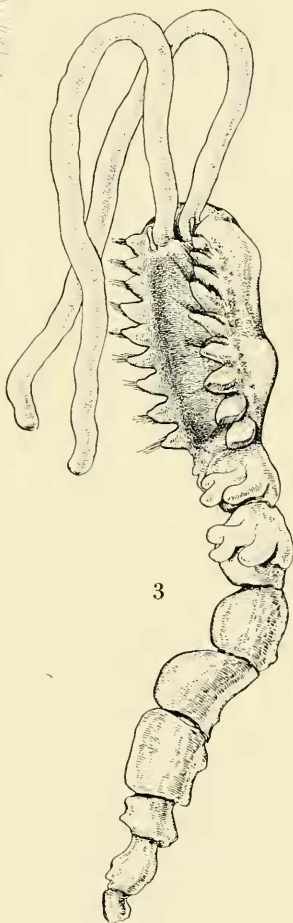
1



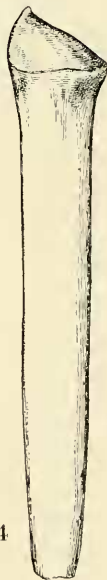
5



2



3



4

PLATE 11

Tharyx tessellata, new species (sta. 5563)

1. Entire animal partly extended from the tattered tube, x 14.
2. Anterior end, including first 4 setigerous segments, in dorsal view, x 70.
3. Posterior end of body, showing inflated posterior segments and dorsal anal pore, in dorsal view, x 54.
4. A neuropodial seta with lateral serrations, from a post-median segment, x 175.

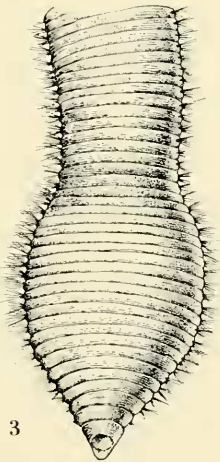
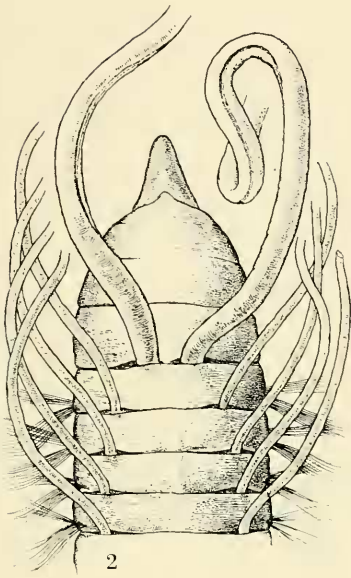


PLATE 12

Tharyx monilaris, new species (sta. 4723 and 5586)

1. Entire animal, showing inflated anterior and posterior ends, with front end in left lateral view, and posterior end in dorsal view, showing relations of attached branchiae, and comparative lengths of setae, in atokous individual, x 80 (sta. 4723).
2. Anterior end of an epitokous individual (from sta. 5586), showing greatly enlarged ovigerous segments, and elongated setae, in dorsal view, x 115.

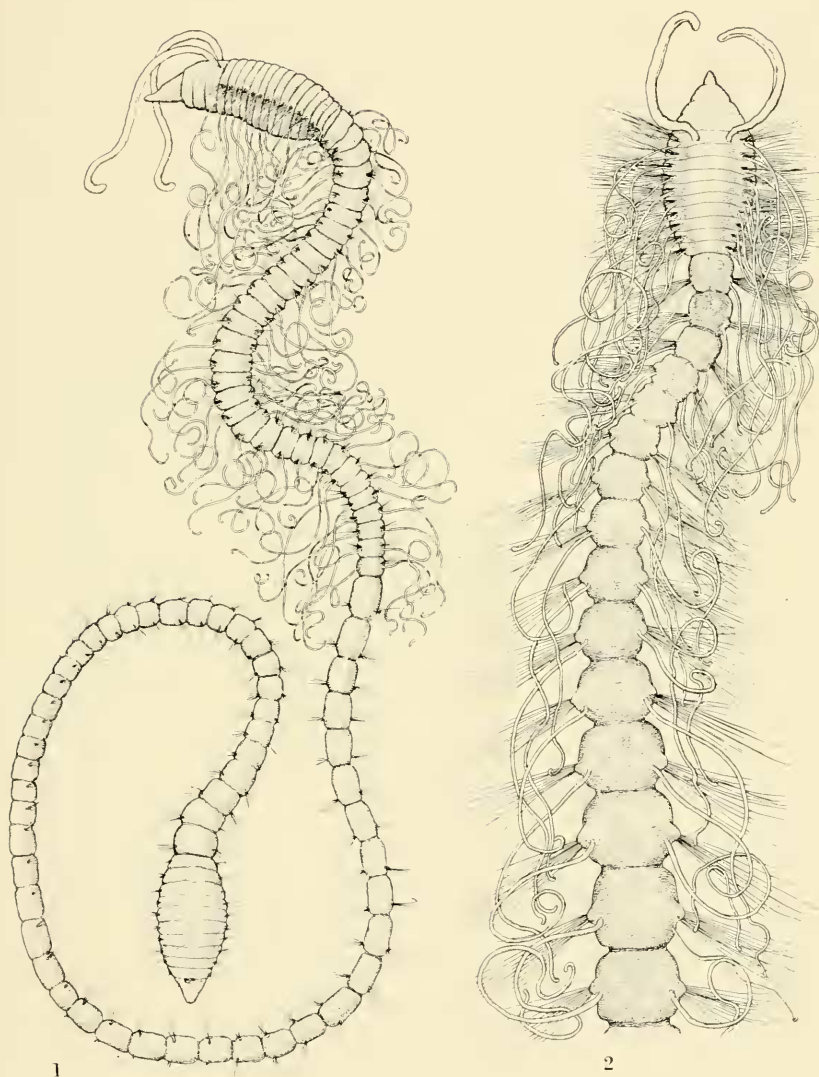
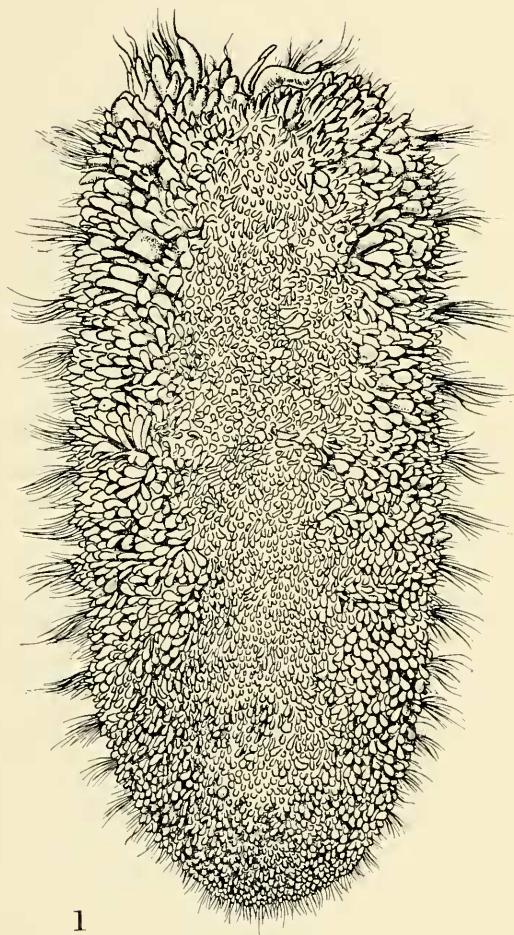


PLATE 13

Ilyphagus ilyvestis, new species (sta. 6351)

1. Entire animal in dorsal view, x 12.
2. Distal end of a neuropodial seta, x 400.
3. Part of a notopodial seta, showing proportions of cross bars near the distal end, x 400.



2



3



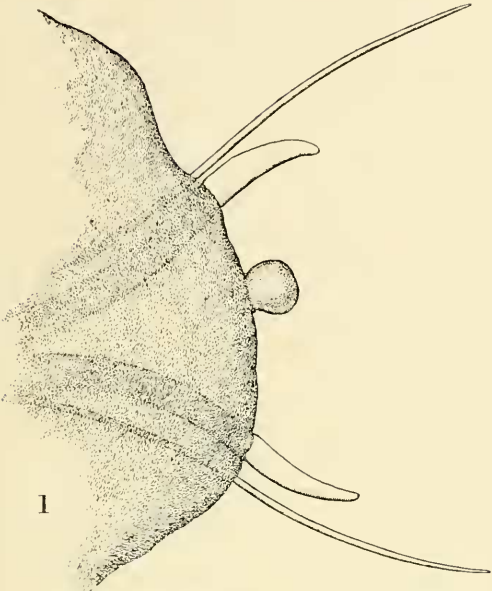
PLATE 14

Brada glabra, new species (sta. 6341)

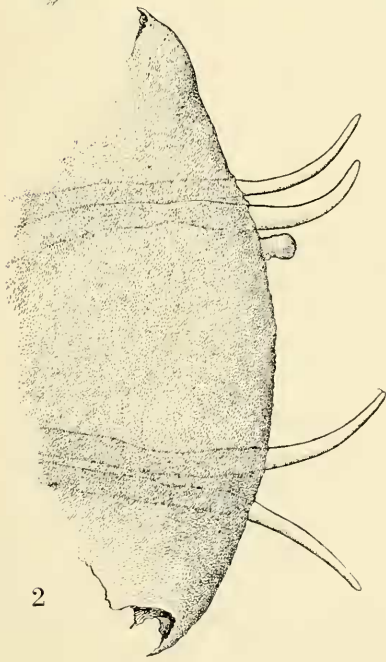
1. Sixteenth, or a median, parapodium, x 134.
2. Last parapodium, x 134.

Ammotrypane pallida, new species (sta. 3031)

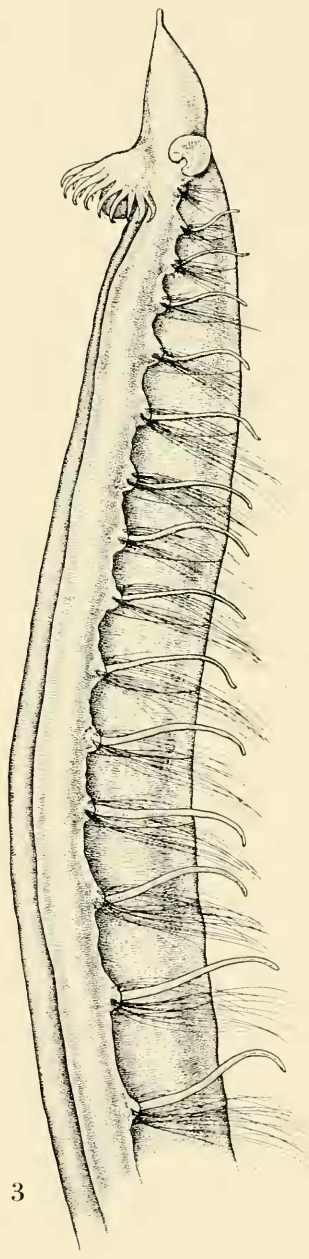
3. Anterior end of the body, in left lateral view, showing the prostomial palpode, everted nuchal organ and fimbriated everted pharynx, in anterior region, and the relations of branchiae and parapodia on segments, x 21.



1



2



3

PLATE 15

Lumbriclymene lineus, new species (sta. 5935)

1. Anterior end including first 5 setigerous segments, in left lateral view, x 18.
2. Posterior end including last setigerous segment and pygidium, in right lateral view, x 18.

Praxillella trifla, new species (sta. 6341)

3. Posterior end shown extending from an arenaceous tube, with extended anal cone and 3 long cirri, x 22.
4. Rostrate, long handled uncinus from a median neuropodium, in lateral view, x 1010.

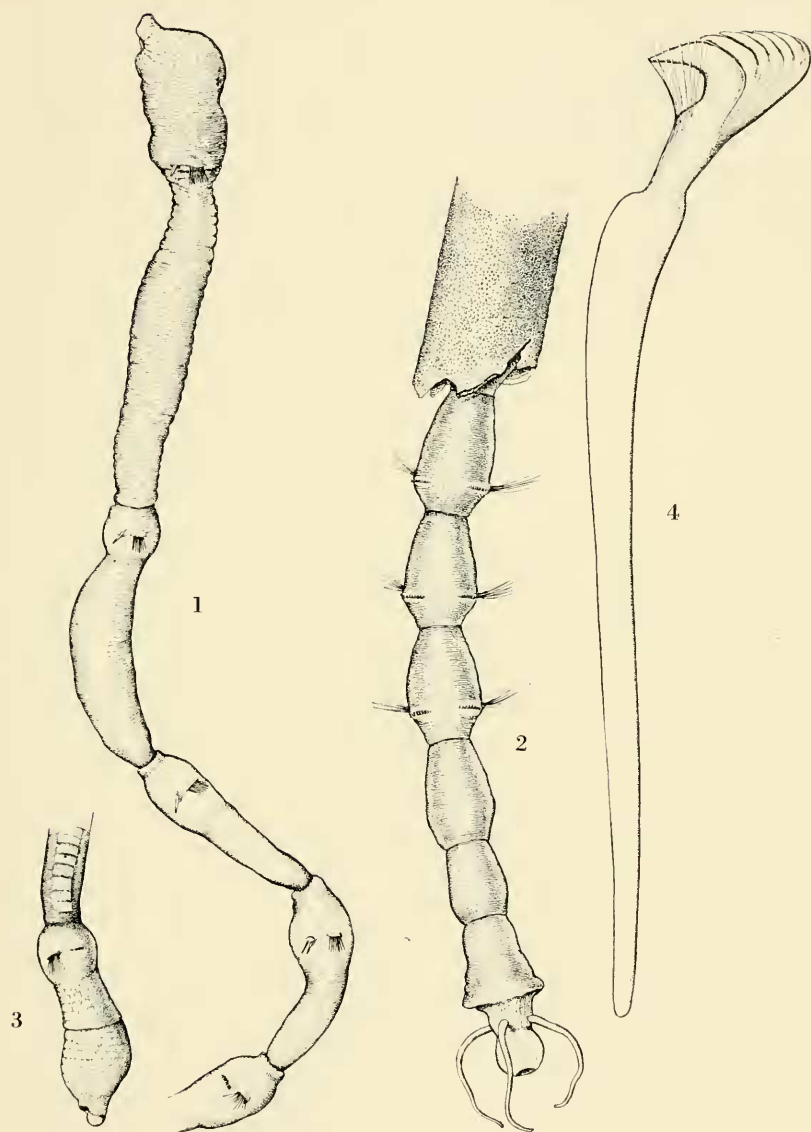


PLATE 16

Myriochele pygidialis, new species (sta. 5944)

1. Entire animal in dorsal view, x 14.
2. Anterior end, including first 4 setigerous segments, in ventral view, x 90.
3. Posterior end, showing pygidial cirri, in right lateral view, x 90.
4. Long handled uncinus, with 2 distal teeth, in lateral view, x 4000.

Myriozwenia californiensis, new species (sta. 2175)

5. Anterior end, in left lateral view, x 40.
6. Uncinus from a neuropodium, x 2750.

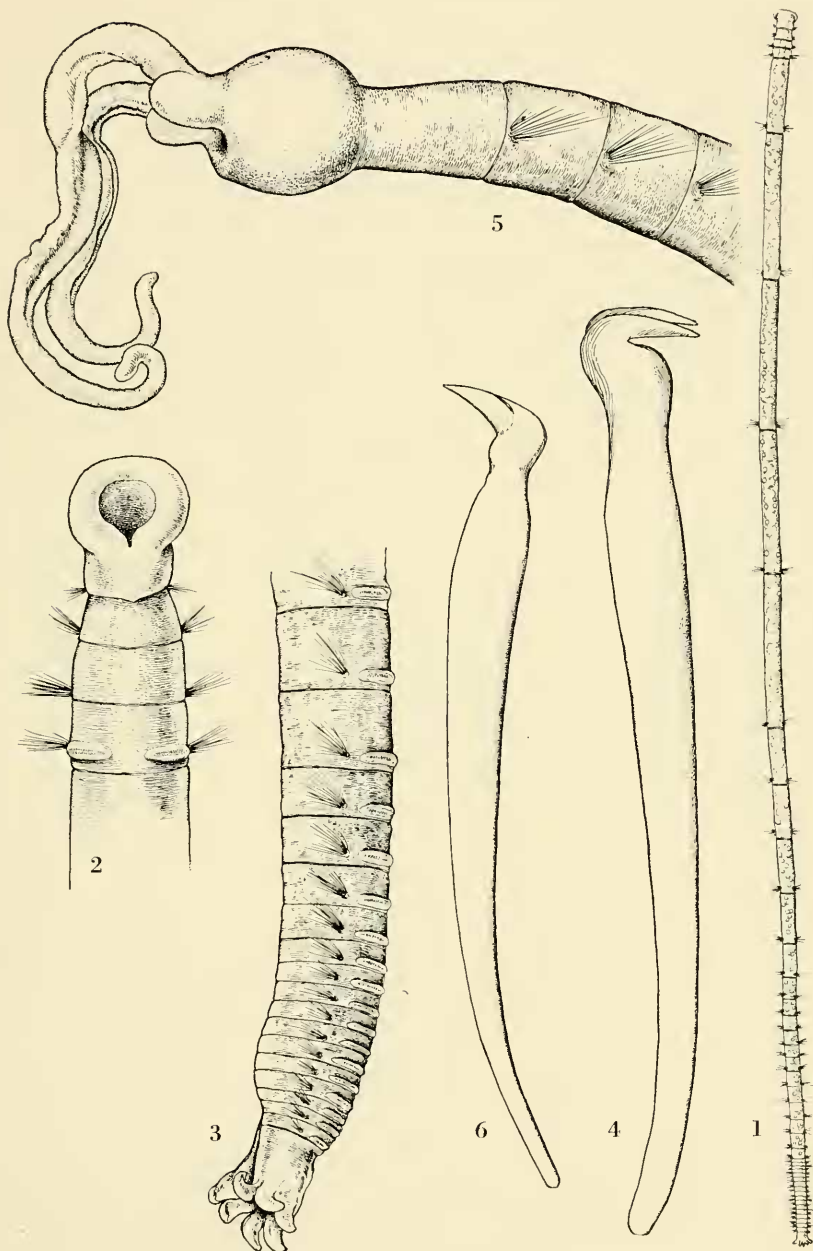


PLATE 17

Image longibranchiata, new species (sta. 3020)

Entire animal in dorsal view, showing branchiae extended and peristomial membranes turned back to disclose nuchal organs, x 15.

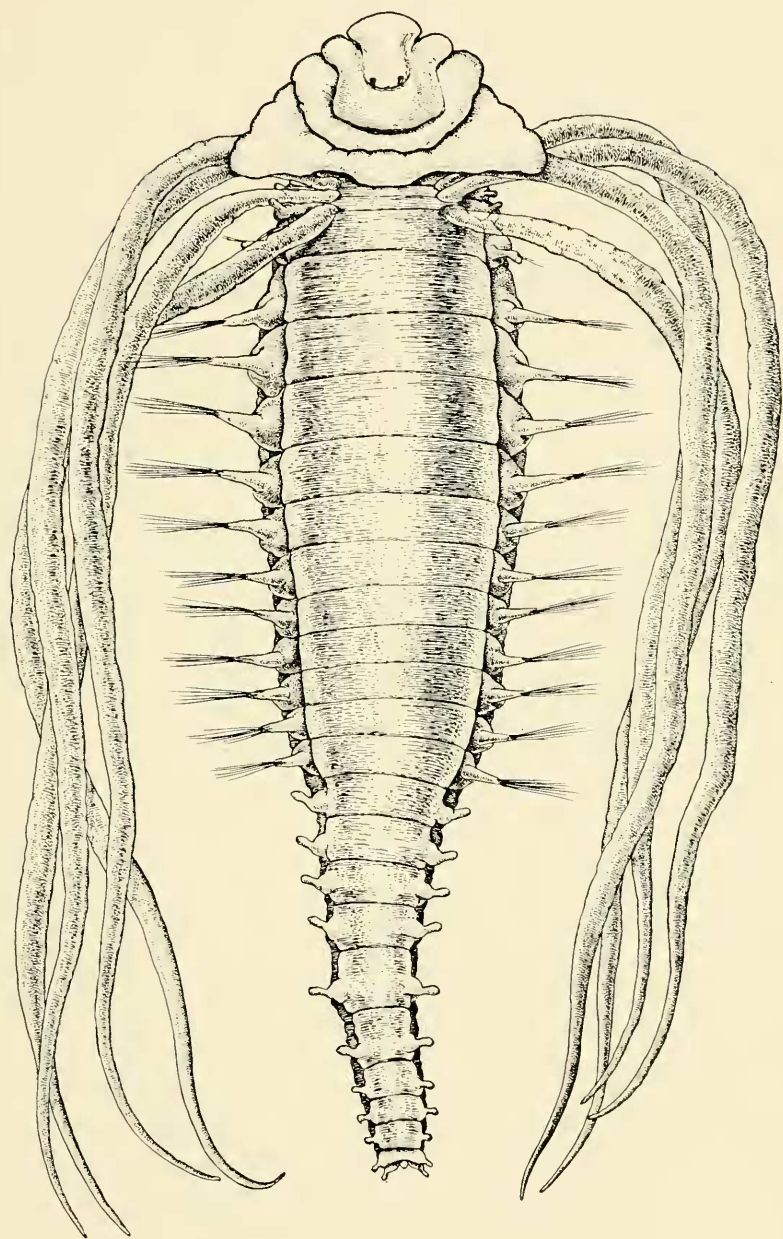


PLATE 18

Fermiliopsis biformis, new species (sta. 2130)

1. Tube attached to fragment of shell of *Lacqueus*, showing dual character of tube, with the proximal part fully attached and dorsally ridged, and the distal part erect and cylindrical, x 12.
2. Operculum with stalk contracted and appearing annular, x 90.
3. Operculum with stalk from another individual, not annular, x 90.

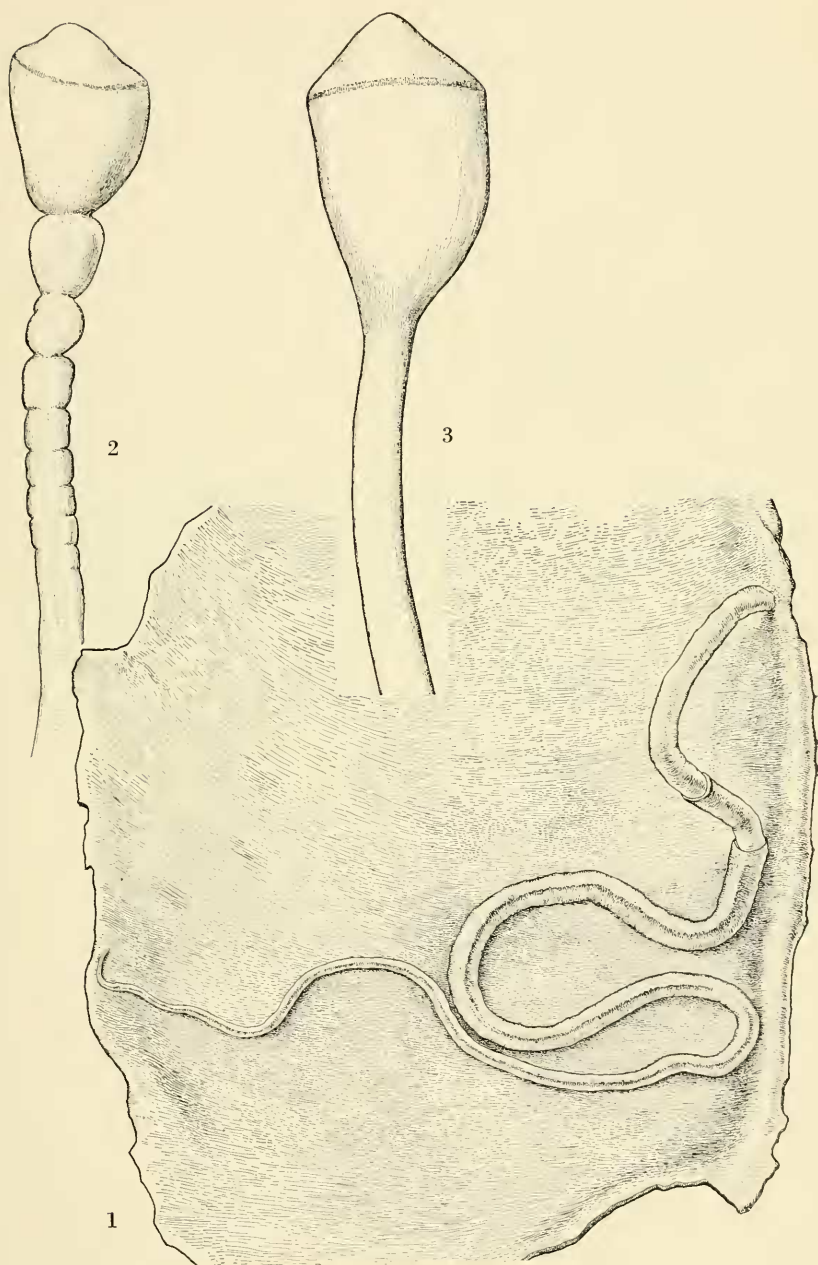


PLATE 19

Vermiliopsis biformis, new species (sta. 2288)

Two valves of *Lacqueus*, in dorsal view, showing attached
tubes of *Vermiliopsis biformis*, slightly enlarged.



